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LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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EDITORIAL NOTES.

The Industry's Congratulations and a Dinner.

MANY of the friends of Sir David Milne-Watson, LL.D., D.L., have desired that an opportunity should be given at which the congratulations of the industry—*quâ* industry—could be offered to him on the honour which has been conferred upon him by His Majesty, and expression be given of their appreciation of the invaluable services he has rendered to the industry. Those services have been unique. Two of the industry's revered leaders have previously had the honour of knighthood bestowed upon them; but they were not called upon to perform such work as the last decade—through the great war, and all that has succeeded it—has imposed upon Sir David, whose time, abilities, and position have been devoted unstintingly to it, with the backing for the general good of all the influence that the Gas Light and Coke Company could bring to bear. There has been no stint of self-sacrifice—willingness has always been the one thing visible, and performance the result. With Sir David's consent, it has been decided that the desire of the gas industry shall be fulfilled at a banquet to be held at the Savoy Hotel, on Tuesday, March 8.

The proposal has been received with great enthusiasm by representatives of the Councils of the six central organizations of the industry, who have been concerned, with the Organizing Committee, in making the preliminary arrangements. Owing to the limits in respect of capacity for such an event, the Organizing Committee have, reluctantly but compulsorily, had to impose some restrictions in regard to numbers, though recognizing that the wish to be present, on such an occasion, will be very general. It is therefore felt that a representative gathering of all interests composing the industry will be obtained by invitations to participate being issued to: (1) The President, Past-Presidents, Vice-Presidents, and General Committee of the British Commercial Gas Association; (2) the Central Committee of the Federation of Gas Employers; (3) the President, Vice-Presidents, and Committee of the Gas Companies' Protection Association; (4) the President, Past-Presidents, Vice-Presidents, and Council of the Institution of Gas Engineers; (5) the Central Executive Board and honorary members of the National Gas Council; (6) the President, Past-Presidents, Vice-Presidents, and Council of the Society of British Gas Industries. This decision has called for the issue of no less than 275 invitations. This will ensure just what is desired—a gathering representing every component part of the activities and interests of the industry; and the inclusion of Past-Presidents of the various organizations will bring together men who have served in office during the years of the most pregnant work Sir David has done for the industry. It should be mentioned, so as to avoid any misconception, that the event is a subscription one.

A further excellent inspiration which assists the main idea of giving the occasion a purely industrial representation is the selection of Chairman. Prof. Arthur Smithells, F.R.S., has been invited, and has willingly assented, to take the chair at the dinner. Although never directly engaged in the industry, he is (so to speak) one of its common possessions. He has worked long at its scientific problems; he is as much at home in the Society of British Gas Industries (of which he has been President) as he is in the Institution of Gas Engineers, the National Gas Council, or the British Commercial Gas Association. His scientific counsel is at the disposal of all. He is one of us, without ties to any one section. He knows intimately the industry's affairs, its difficulties, and its successes; and the great part Sir David has taken in its defence and the progress of its aims.

Our now more leisured friend Mr. W. E. Price is acting as the Hon. Secretary and Treasurer to the Organizing Committee; and Mr. W. J. Smith, the Secretary of the National Gas Council, is kindly assisting him.

Come to the Conference.

LAST week pointed attention was drawn by us to the Maintenance Conference to be held at the Institution of Mechanical Engineers on the 16th inst.—Wednesday next—and published, in a supplement, a digest of relevant papers that have been presented to various organizations in recent times on that very important subject. To-day we want particularly to emphasize the point that this is strictly a conference—a conference of everyone in the gas industry who is interested in the matter, whether as an enthusiastic believer in comprehensive inspection and maintenance of all the gas consuming fittings and appliances in every consumer's premises; as a lukewarm believer in partial maintenance; or as one doubtful of the wisdom of any such policy and hesitating over the questions of cost or responsibility. The object is to confer together upon all points, alike of advantage and of difficulty, in order to help everyone if possible to a wise decision in respect of the particular undertaking with which he is connected.

It is particularly the doubters and hesitators whom those responsible for summoning the conference hope to see present, and to hear from. No one wants to "preach" to anyone. All want to learn from the others. But no one can learn from, or help in conference, those who are not there. And those who believe, with us, that the future progress and prosperity of the industry in no small degree depend upon a broad-minded, whole-hearted, courageous policy in this matter of securing that every consumer's means of consuming gas is as suitable, efficient, and safe as it can possibly be, are keen to have the opportunity of putting before any colleague who may feel doubts or qualms concerning such a policy, the arguments in its favour, and of discussing the pros and cons.

There will be questions to discuss both of principle and of detail—the "why we should," and the "how we best can," inspect and maintain consumers' appliances—and the conference should be interesting and valuable from start to finish. We know that it is being anticipated with great interest by the leaders of the industry, who realize to the full the importance and urgency of the question. We also know that it is welcomed by others outside the industry who have its best interests at heart, and are keenly anxious that, in this matter especially, the industry should deal with its problems from within on its own initiative and render quite unnecessary any stimulus or action from without.

So we say to all: "Come to the Conference—and, most "of all, come if you have any doubts or fears to express "and dissolve."

Emergency Value of a High Standard of Organization.

THE annual accounts of a gas company can only be regarded as exhibiting the framework of the year's operations of the undertaking; and this is markedly the case in such an eventful and critical year as the one through which the gas industry has just passed. The speech of the Governor of the Gas Light and Coke Company (Sir David Milne-Watson) to the proprietors last Friday supplied the filling to the financial, manufacturing, and trading framework of the remarkable year 1926, which was examined in our editorial columns last week. He lifted the veil slightly but sufficiently to show those proprietors who were observant something of the extraordinary anxieties and difficulties which had to be met and surmounted during eight months of the year, the results of which the Board are still engaged in clearing up. While he unfolded the unusual story, there was among the body of proprietors present the fullest sympathy with the Board, officers, staff, and workmen generally. There was satisfaction that they had been so eminently successful; and gratification when it was heard that the big undertaking is within measurable distance of the end of all the year has imposed upon its operations. When the price of gas reaches pre-war level again, which (with 1·4d. per therm off at the end of March, leaving a coal stoppage balance of 0·8d. per therm) Sir David believes will be before the end of the year, there will only remain the memories and experiences of the great upheaval which was brought about by labour factionists, whose operations were directed to the fuel starvation—not of one particular section of the community, but of all sections, including workers of every grade.

Listening to the tale of the year of such a gigantic concern, with all the responsibilities which size imposes, the thought crossed the mind that there would not—"could not" is the better term—have been the same successful handling of such a grave situation had the organization remained as it was at a time within the memory of some of us. And great credit must be given to the present Direction, working upon what was done by their immediate predecessors, for the remarkable change that has come about in the organization of the concern, and for the new spirit and the sense of individual responsibility which have been engendered in all ranks of the service. With those conditions at their backs—conditions largely created by themselves—the Board's task was lightened (compared with what it would otherwise have been) in seeking, obtaining, and utilizing the wherewithal to produce, distribute, and sell (save the low percentage of unaccounted for) 47,429 million c.ft. of gas, or 237,922,825 therms, which constituted the year's demand. The huge mechanism of many parts worked smoothly and well, or at any rate as smoothly and well as external influences would permit. The importance of what has been done in respect of organization and the creation of a good spirit cannot be over-rated at such a time as this—not only through the ranks of workers, from Directors downwards, not only on the works, but on the district, where improvement operations of an extensive order have been going on in recent years, and have made their contribution in the circumstances of the past one. The Company have been spending large sums of money in scrapping, renewing, and modernizing consumers' appliances, to place in their possession the means of obtaining the utmost efficiency from their consumption of gas. We know what happened, when the Company appealed for economy. The people residing in the vast supply area regarded the gas-mains (to use the Governor's simile) as their coal-cellar; and they made good use of such a convenient one, and were (in many cases) only confronted by the fact of the existence of a coal strike on opening their newspapers, unless it immediately affected employment or business. The fact that this one Company in the depth of winter require, and have to deal with, 70,000 tons of coal a week, did not disturb them; the anxieties of scouring the world for coal and securing it, and the difficulties of performing, in the circumstances, the stupendous work that was accomplished, were hidden from them. Their consumption of gas went on in much the normal way; but the consumption would have been greater still if the work of the past few years had not been done, nor so much effected in the displacement of inefficiency by efficiency in the consuming appliances. No gas undertaking can regard itself as fully prepared for an emergency of such an order if organization throughout the undertaking and equipment from production to utilization are not maintained at the highest practicable standards of efficiency. Last year's lessons in these respects are highly valuable.

Now English coal is again coming in regularly; and the Company have had delivery of the last of the foreign coal. There is consequently a feeling of relief on the part not only of the Board, but of those who have had to handle the coal. They prefer the coal from Durham and Yorkshire, to which they are accustomed. As already said, the large extra outlay which has been incurred will be wiped-out some time this year by the (after March) remnant of increased charge. The position is more comfortable; the outlook for the gas business is a pleasant one. At the moment, the one cloud is the reduced value of sulphate of ammonia, due to over-production of nitrogenous fertilizers. Now that the great trial is over, there is to be no pause in the work of incorporating the utmost attainable economy and efficiency in all the operative and trading parts of the undertaking, including the making of the best possible use of the new training centre—Watson House. The proprietors have cause for gratification over the policy which to-day governs the Company; also over the timely introduction into the sliding-scale of the minimum dividend of 5 p.ct., which has given new confidence among investors. As the Governor said, had gas stocks received another blow such as was experienced during the war, it is doubtful whether confidence in them could have been inspired again. It is time every sliding-scale undertaking sought similar protection. The general feeling among the proprietors last Friday was obviously one of indebtedness to those who had directed, and taken part in, the operations of the concern through these perilous months. Accompanying this were the happy and vivacious phrases of the new Deputy-Governor (Mr. Henry Woodall), Mr. W. A. Hounsom, Mr. H. Rayner, and Mr. Mark Johnson, and the hearty endorsement of the proprietors, which carried to Sir David the profound gratification of all concerned in the Company at the honour conferred upon him by His Majesty The King. But of all the congratulations, none has given greater pleasure than those received from all ranks of the employees. Altogether this was an exceptional meeting, having regard to all that has taken place in connection with the Company during the past year.

Mutually Developing Economy.

GREAT changes have been, and are being, introduced into the gas industry. One is foreshadowed in the notices of the meetings of the proprietors of the South Metropolitan and South Suburban Gas Companies. The South Metropolitan Act of 1925 (in which the perspicacity of the President, Dr. Charles Carpenter, is plainly evidenced) allows of agreements being made between the Company and other gas undertakings for "mutual assistance and for other purposes." As is well-known, the South Metropolitan Company have large works and resources on the Thames at East Greenwich, and, in addition, they have their coal-purchasing organization at Newcastle, a fine fleet of steamers for the conveyance of coal, and their laboratories at Old Kent Road, where research is constantly proceeding into coal, its carbonization, and the primary and secondary products, together with their treatment. These constitute an organization of which many less affluent industrial concerns might be, and no doubt are, very envious.

In the preamble to the South Metropolitan Act of 1925, it is categorically stated that "it would be of public advantage, and tend to the reduction of the price of gas, if provision were made whereby such facilities, organizations, and advantages as the Company have provided, or may hereafter provide, could be made available for the benefit of any company to whom the Company may supply gas." It is obvious, from the notices of the meetings of the two Companies, that their respective administrations

agree that advantage of an economic nature would accrue to both by the employment of the resources of the one in the operations of the other. Consequently an agreement arrived at by the Directors is to be submitted for approval to the proprietors of both Companies at their forthcoming meetings. This is highly interesting, because some years ago the South Suburban Company were contemplating the construction of new works at Belvedere, to enable them to get the transport advantages which the construction of works on the riverside would give them. But the scheme has not developed, owing probably to certain physical disabilities of the site. Since that scheme was in embryo, thought and knowledge have expanded to an extent which has convinced our leading gas administrators and technicians that concentration of production and working inter-relations between undertakings can be made of a beneficial nature not only to the participating concerns, but to the communities they serve. In this case, there can be no question that the advantages which would have accrued from a directly owned riverside site to the South Suburban Company can be obtained *viâ* the East Greenwich Works of the South Metropolitan Company; and it is easy to see that economies of no mean order in respect of capital and working outlay can be realized by utilizing that Company's equipment to the utmost extent. On the other hand, advantage to the South Metropolitan Company will accrue from the fact that fully employed plant and organizations can be worked more economically than when not utilized to their complete capacity, or when their advantages are not spread over the largest practicable area.

Thus it has come about that we are on the threshold of a scheme under which (if ratified by the proprietors of the two Companies) a bulk supply of gas will be provided by the South Metropolitan Company for the South Suburban Company for the next quarter of a century; and, if a quarter of a century, no doubt in perpetuity. The coal required for the use of the latter Company's own works will also be unloaded at East Greenwich, and placed on rail or in barge (as the case may be) for the completion of its journey; the material being sampled and tested for the South Suburban Company in the laboratories of the South Metropolitan Company. There are also clauses in the agreement whereby the two Companies will become mutually interested financially and administratively. The South Suburban Company and their Directors will endeavour to secure that proprietors of £500,000 of ordinary stock shall exchange it for 6 p.ct. irredeemable preference stock in the South Metropolitan Company, and to obtain powers, when raising fresh capital, to issue a certain portion of it to the South Metropolitan Company. A Director of the South Suburban Company is to be nominated for membership of the Board of the South Metropolitan Company; and the Directors of the former are to endeavour to secure that three persons, from time to time nominated by the Directors of the South Metropolitan Company shall be members of their Board. If any Director of the South Suburban Company, after the approval of the agreement by the Board of Trade, desires, by reason or in consequence of the agreement, to vacate his office as Director, he shall be compensated by a sum equal to seven years' purchase of his annual fees. Two of the Directors of the South Metropolitan Company are at the present time Directors of the South Suburban Company, and would be in a position to avail themselves of this provision should they so desire.

The great point about all this is that it provides for working inter-relationships which have for their object mutual economy. It is an elementary duty of those responsible for the administration of gas undertakings to bring all and every economy to bear upon their interests; and the methods outlined here comprise one way of operating to reciprocal advantage. At the same time, it carries out what we believe to be a view of Dr. Carpenter, that, in the interests of local trading, it is a pity to uproot old-established connections and influences. Local companies are institutions; and generally their Directors, and always their officials, are known in the localities they serve. This being so, their retention has a trading value, which is sometimes sacrificed in amalgamations, though some compensation can be made through the district office and showrooms.

Fuel Co-operation Between Gas and Electricity.

IT is the view of Mr. A. Hugh Seabrook that the progress of the principle of combined supplies of gas and electricity has been distinctly disappointing, while the results have been good where it has been applied. We agree; and the obstacle to progress is traceable to the line developments have taken in the electricity industry, with, accompanying, an amount of official prejudice. It is still, however, a moot question whether in those areas which have not an undertaking supplying electricity, and in areas where some electricity concerns are only succeeding in maintaining a somewhat miserable existence, combination would not be better for all. In the former cases, there can be little doubt that electricity generated and purveyed by a gas-works would be a more economical proceeding than utilizing current from a super-station, if costs for long-distance transmission were involved. But the powers that be have ordained that concentration of generation shall be pushed to the utmost extremes, with the concomitant of a transmission system which increases in magnitude and distances the greater concentration takes place. That by the way. The gas industry is a highly flexible institution, and has proved a splendid adaptability to any circumstances that may come along. This being so, and electricity generation on the gas-works for public supply being frowned upon by the Electricity Commissioners—perhaps the Central Electricity Board (headed by Sir Andrew Rae Duncan) will be more friendly—there is not the slightest reason why gas undertakings, with their established resources and organizations, should not become the distributors of the super-power station electricity, instead of incurring unnecessary expense by running two separate concerns. If concentration at one end produces economies, there is no reason why it should not do so at the trading end.

We have previously made this point. Mr. Seabrook's paper before the London and Southern District Junior Gas Association (reproduced in this issue) permits of its being made again. His contribution dealt with the trend of things in the electricity industry; and it also deplored the attitude taken in respect of combined supplies, which attitude is the outcome of fidelity to a great idea, with an absolute indifference to the economic interests of the people who live in areas isolated from the more densely populated ones, and who therefore need a studious and generous regard for the development of the economies which lie nearest at hand. However, Mr. Seabrook is hopeful of other possibilities materializing for co-operation between the gas and the electricity industries. He finds the open door in section 23 of the new Electricity Supply Act, which authorizes the Central Board to purchase any surplus electricity from anyone who generates it by water power, waste heat, or otherwise. There is admiration on Mr. Seabrook's part over the "enormous" amount of waste heat that is being harnessed in gas-works for their power requirements. Without a definition being applied to the term "enormous," we do not like its appearance. To the layman, it might suggest a tremendous inefficiency in gas-making processes, where, so far as carbonization is concerned, the contrary is the case. There is, he says, undoubtedly much surplus heat that cannot be absorbed by the works, but which could, turned into a suitable form of power, be well supplied to the Central Board. He knows of cases where only a small amount of surplus heat is being utilized for gas-works purposes: and great quantities could be recovered if only there were an outlet for it. Of course, the conditions of gas-works vary in this regard. Gas-making processes and their conditions differ; and the requirements for steam do the same. Where steam requirements are low and the gas-producing operations of the works are on a large scale, the aggregate of the surplus waste heat would be greater than where the contrary conditions prevail. But it must not be overlooked that, while there must be some waste heat which is always available for steam-raising, work is going forward with the view to reducing the surplus waste as much as possible, and raising still further the efficiency of the gas-making process, whatever its character. The more there is success in this direction, the less will be the surplus of waste heat. But there is no definite knowledge in exist-

ence as to the quantity of waste heat that is available; and, before there can be any positive decision, there must be more investigation than there has been up to the present. But should it be found that in any case there is available a quantity of waste heat which can be turned to profitable account by supplying electrical energy to the Central Board, then the gas industry will be fully alive to the opportunity. As Mr. Seabrook says, no further statutory powers are required. A gas undertaking may generate electricity on its works; and the Electricity Act of last year gives all the authority required for bargaining with the Central Board for its purchase.

Then there is another anticipation in Mr. Seabrook's paper. He believes that pulverized fuel firing is the coming system in electricity generating stations, owing to its flexibility in allowing any form of fuel to be utilized. Moreover, there is every indication that the efficiency of the pulverized fuel equipment is going to be superior to the mechanical stoker equipment, and that the cost of the complete boiler-house, through pulverized fuel, is going to be lower than with other systems. Mr. Seabrook is inclined to think that eventually the low-temperature system of carbonization will be linked-up to the use of pulverized fuel in generating stations. We are disposed to the view that the day is far distant when that will happen. There may be one or two plants working in connection with private generating stations which, in present circumstances, are giving satisfaction to their owners. But one thing the electricity industry has to guard against is uniting with electricity generation any process which will expose their primary business to the market fluctuations of every product that is secondary to the one of producing semi-coke. A question we should like to ask Mr. Seabrook is why, in view of the article on "Fuel Relativities" which appeared in our columns last week, electricity undertakings should want to produce low-temperature coke containing a fairly high volatile content, which is less efficient for steam-raising than high-temperature coke in the pulverized form. We notice that he himself admits that the burning of pulverized coke in the combustion chamber of a boiler produces even more efficient results than burning pulverized coal; but he asserts that the expense of pulverizing coke is great, though he confesses that there are no accurate data available as to the expense of pulverizing coals, such figures as have been published varying greatly. We should, therefore, like to have more positive information as to what is meant by the cost of pulverizing coke being great.

There is agreement with Mr. Seabrook that there is room for co-operation between the gas and electricity industries; but, examining the question in the light of recent developments, we feel that nothing definite can now be said regarding the matter until there has been a thorough exploration of the various avenues through which there is a possibility of co-operation. Before concluding, we should like to set Mr. Seabrook right on one point. He says he notes the tendency in gas-supply practice to close down small, inefficient, and isolated gas-works, and to connect them up to much larger works on the lines of electricity practice. Mr. Seabrook would have to go back as many years as—we should say, more years than—his own existence to find the beginnings of this connecting-up of inefficient gas-works to larger and more efficient ones. It has been going on slowly and here and there for decades; but it happens that the view in the industry to-day is that the policy is one which in the circumstances of the times should be accelerated, and not pursued in the old leisurely fashion. It is the practice of the gas industry that is being followed by the electricity industry.

Registration of Engineers.

THIS matter has cropped up again; and the Bill which the Society of Technical Engineers introduced into Parliament last session will, if it has luck in the ballot for Private Bills, be on the *tapis* again this session. The Secretary of the Society (Mr. Richard Hazleton) has been addressing the Institution of Production Engineers on the subject. He told them that he does not believe that there is any difference of opinion among engineers regarding the desirability of their registration as a means of improving their status and protecting the public. Mr. Hazleton is apparently innocent of the views of many men of established position in the profession. They are not particularly in favour of enrolment on such a register as the Society contemplate, nor do they see any reason to think that it would do anything to improve their professional reputation or status. Reputations are not made by going through a course of training and qualifying for registration, but by ability and actual work, and, if ability is not a sufficient defence without registration, then we should not accord the ability a very high rating. The basic idea of the Bill is that the engineering profession wants protection against those mountebanks who profess and call themselves "engineers" although they do not possess the necessary qualifications; likewise that the public require protection against unqualified persons. Generally speaking, members of the community do not have occasion to employ engineers; most administrative bodies, companies, and firms who need the services of an engineer have available ample means to see that they get someone worthy of the title. Then, again, Mr. Hazleton's belief that there is no difference of opinion among engineers as to the desirability of registration, is rather assailed by his confession that the leading engineering institutions have not expressed any definite views with regard to the Bill. The neglect is eloquent of unexpressed feelings.

The details of the registration scheme were dealt with in the "JOURNAL" for June 2 last (p. 448). It will be remembered that the Bill provides for fines or imprisonment in the event of any unregistered person practising as an engineer. What would happen if some of those engineering princes in Westminster refused to be registered, we dare not think. The country would be poorer by being deprived of their valuable services. But supposing that, unregistered, they did give engineering advice, just imagine their being hauled before a magistrate, and fined or imprisoned. It would bring the whole thing into ridicule. It will interest Great George Street and Victoria Street, and the engineers of our local authorities, companies, and constructional firms, to learn that Mr. Hazleton is willing to make a concession. He agrees that the provision for imprisonment as an alternative to a fine for practising without registration might well be deleted from the Bill. We breathe again. A fine would not much matter; but imprisonment——. The Society evidently intended to be thorough; but their intentions overran the limits of discretion. However, the leading engineering institutions will no doubt take heed of the warning that, if the Society of Technical Engineers are compelled to go ahead without their support, are successful in getting a second reading for the Bill, and it is referred to a Standing Committee, then those leading institutions would have to justify their position in not supporting the proposals. We rather think that Parliament will realize that the Bill has not been promoted by the leading institutions, and that the withholding of their support is the best evidence of their dissent, without wasting time in asking them to say so. We have not noticed any perturbation on the part of the leading institutions, most of the members of which are satisfied that the fact of their membership is a sufficient warranty that they are engineers. And they are not likely to be worried or moved by the veiled threat that the Society will proceed despite them. Before the Society got so far as they have done, they should have judiciously used the plumb-line to ascertain the depth of the support they were likely to receive. As it is, if their pride is wounded, they have only themselves to thank.

A New Coke-Stove.

A coal fire is at its most cheerful and useful point when the coal is reduced to coke, and is an incandescent mass. At all events, this has been the view during the cold and cheerless days which have been experienced this winter. If we contemplate a coal fire at the stage when the characteristics to which we have referred obtain, then it is easy to see that, if coke for room-heating purposes is treated in a manner which will enable it to yield its best from its own particular properties, then something better than a coal fire should result. An article in later columns dealing with the "Rayflex" open-fire coke-

stove (which Dr. Geoffrey Weyman has invented, and which is novel in its action) shows that success has attended the effort to develop a stove which will give from coke the maximum cheerfulness and usefulness. In it Dr. Weyman has applied the down-draught principle. The air for combustion passes first through the newest fuel, then through the partially burnt fuel, and leaves the fire by the ash-pit, through the fire-bars, to a flue-box at the back of the stove, and on to the chimney. The considerations as to why this system is superior to the old up-draught plan are stated in the article; and the arguments which may be advanced against it are also anticipated, and dealt with. A great feature is that by far the largest portion of the heat developed by the coke is radiated. When it is considered that in a fire the zone of combustion naturally travels towards the point where the air is fresh, and where at the same time the fuel is fresh, then it will be seen that—the position of the entry of fresh air in the case of this stove being at the top of the fuel—the top of the fire presents a brilliant effect, and that newly applied fuel quickly rises to incandescence. The stove is applicable to all varieties of coke, inasmuch as by it an ample and regulated draught is provided to suit any kind. We are sure that the details of this newcomer, as given in the descriptive article, will be pursued with interest.

Power on Gas-Works.

A valuable paper has been contributed to the Institution of Civil Engineers by Mr. H. C. Smith, Assoc.M.Inst.C.E., of Tottenham, on the subject of the "Applications of Power on Gas-Works." In other columns we give an abstract of the paper as issued by the Institution. In this is embodied an amount of useful calculated data referring to the applications of steam on a gas-works with an output of more than 15 million therms per annum; and, for such works, the author discusses the requirements assuming the whole of the power is supplied as electricity generated at an efficiency of 14 p.ct. In the special circumstances considered, it will be seen that it is computed that 83 p.ct. of the total steam needs of the works for power, gas making, and other purposes could be met by the utilization of waste heat.

Good Coal Outputs.

During the week ended Jan. 15, the quantity of coal raised in this country was 5,244,700 tons; and the number of persons employed at the mines was 978,900. These figures give an average production per wage earner of 5·35 tons, compared with 5 tons in the corresponding week of last year, when 5,460,000 tons of coal were raised, with 1,092,000 workers. In the week ended Jan. 22, the quantity of coal raised was 5,107,800 tons; and the number of wage earners at the mines was 989,700, which gives an average production of 5·25 tons per worker. This was not so good by 0·1 ton as the previous week.

Elimination of Gas.

In the course of our journalistic work, we occasionally come across some amusing ideas. Mr. J. Rankine Andrew, the Moderate candidate in the Park Ward Municipal By-Election of Glasgow, supplies an example. In the course of an address delivered by him on Feb. 2, Mr. Andrew (we read in the "Glasgow Daily Record and Mail") made the suggestion that economy in civic administration might be realized by the amalgamation of the Gas and Electricity Departments of the Corporation, and the gradual elimination of gas. A Moderate candidate should not have such immoderate views. It is clear to us that Mr. Andrew would not, so long as he entertains this view, make a good servant of the community. Before he proceeds farther in his advocacy in this direction, he should make a close study of the relative efficiencies of the two undertakings in respect of the utilization of fuel, and also of the important place which gas supply has in the economy, efficiency, and service of the community. Until he knows something more about these matters, his own efficiency and qualifications for the position of municipal representative are distinctly short of the standard desirable.

Leeds University Fund.

The latest published figures show that the total sum so far received or promised for the development fund is £292,943, or about three-fifths of the amount required. Small contributions, as well as large, are earnestly sought. Donations of £1 and under have not reached 650.

Is this a Precedent?

Many instances of local authorities purchasing gas undertakings from gas companies are in existence; and there are many cases of gas companies acquiring smaller privately owned gas concerns. But we cannot recollect a case of a local authority selling a complete undertaking to a gas company. Are the Knaresborough District Council and the Harrogate Gas Company creating a precedent, by the former selling the whole of their gas undertaking to the latter? The matter is reported in our "Miscellaneous News" columns to-day. There is certainty that the Harrogate Company, with its larger resources, will be able to supply the district at a cheaper rate than the Knaresborough Council could do. The Company have good experience of what can be done in supplying outlying areas.

Trade Union Meditations.

The responsible leaders of the trade unions are seriously meditating over the position of the organizations and future policy, with the result that there is a distinct cleavage between the former and those whose policy is to attempt to achieve something or other by stirring-up strife. The latter not only want politics to be mixed-up with the functions of trade unions, but they desire that Communistic doctrines should be recognized. There are, on the other hand, many men in the trade union world who are anxious that unions should in their operations conform to their title of "trade"—be purely industrial, and non-political. Moreover, several of the leaders have, in the light of the events of last year, come to the conclusion that mutual interest in industry is essential as between employer and employed, and that further conflict would be fatal for both alike. The Minority Movement are very active just now in trying to promote among trade unionists the idea of class war; but if the responsible leaders of the unions maintain their position and strength, that campaign can be defeated. Last week, the Executive Committee of the General Workers' Union—of which the Right Hon. J. R. Clynes is the President, and Mr. Will Thorne the Secretary—put a ban on any of their members attending the conference of the Minority Movement. The London District Committee of the Union regard "the movement as a direct challenge to the Committee's authority, and a flagrant violation of the rules and constitution of the Union."

Miners' Industrial Unions.

The Executive of the Miners' Federation have fresh cause for feeling very sick. The industrial movement among the miners is making good headway. It is reported that there are now over 6000 members of the Miners' Non-Political Union in Durham and Northumberland, and upwards of twenty established colliery branches have been represented at recent meetings. The Nottinghamshire Miners' Industrial Union continue to make good progress in that county and Derbyshire, and several new branches have been formed, much to the chagrin of Mr. A. J. Cook, who carries his Red banner almost weekly into the mining areas with the view of stopping the apostasy. But the Nottinghamshire Union declare they will not again join forces with the Miners' Federation until that body has set its house in order against Red propaganda and the exploitation of the industry for political purposes. Progress is also being made in South Wales, where the Miners' Industrial Union continue to form new branches and to increase their membership.

Carbonization Congress.

The congress which it was proposed to hold during March this year, under the joint auspices of the Institution of Gas Engineers, the Coke Oven Managers' Association, and the Fuel Section of the Society of Chemical Industry, has been postponed until October, owing to the number of other important meetings that are being held during the spring. Very shortly the programme of the congress will be issued, together with other details.

SOUTH METROPOLITAN GAS COMPANY.

A New Director.

Hearty congratulations to Mr. Frederick McLeod, J.P., on his election to the Board of the South Metropolitan Gas Company, in place of the late Mr. John Mews. The elevation is the reward of long, loyal, and constant service. From early youth, Mr. McLeod has been in the service of the Company. His promotions to greater responsibility (which have led to the Board) were first to be placed in charge of the General Office; then raised to the position of Secretary in 1908, when Mr. Frank Bush was elevated to a seat at the Board; and in 1921, he became General Manager of the Company. We can wholeheartedly adopt the words used by the "Co-Partnership Journal" of the Company in referring to the new Director: "Of the services which Mr. McLeod has rendered to the Company, of the place he has taken in the social life of the staff and employees, of his keen interest and ready sympathy in all that pertained to the 'human element,' it is difficult to speak as we would like. What we can say is, that the copartners of the Company heartily congratulate the new Director on his elevation to the Board, and that the only misgiving they have is that they may have fewer opportunities of coming into personal touch with him than they have been accustomed to in the years that are gone."

PERSONAL.

The Rhyl Urban District Council have passed a resolution placing on record their appreciation of the services of Mr. L. G. HALL, who for over 34 years held the position of Gas and Water Engineer to the Council.

The Middlesbrough Gas Committee have placed on record their appreciation of the excellent services rendered by Mr. C. F. BLINCOE, the Gas Manager, during the coal stoppage, particularly in having all the gas-works plant ready to operate immediately the coke oven supply ceased. In view of his special services as Resident Engineer during the construction of the holder recently inaugurated, and in consideration of the large amount of extra work during the coal stoppage, the Committee have unanimously recommended that an honorarium of 200 guineas should be awarded to him.

As mentioned in last week's "JOURNAL," Mr. JAMES GRAHAM, Distribution Superintendent of the Kilmarnock Corporation Gas Department, has been recently appointed to a similar position with the Corporation of Lancaster. He left the Greenock Gas Department about three years ago; and during this short period in Kilmarnock he has effected many improvements in the department under his control. With his ever cheery and obliging manner he has enlisted to himself a large circle of friends among both his fellow workers and others in Kilmarnock. During the current session he was President of the Scottish Gas Salesmen's Circle, and also Vice-President of the Scottish Junior Gas Association (Western District). He was held in high esteem by the members of both those bodies. Mr. Graham has been made the recipient of a number of handsome volumes on gas-works practice by the staff and workers of the Kilmarnock Gas Department. He left for Lancaster last week, and took with him the good wishes of his numerous friends for a happy and prosperous future.

Mr. W. H. GIBBONS, the Mains Superintendent of the Coventry Corporation Gas Department, who recently retired after nearly 48 years of service, has been presented with a wireless set by the staff of the Department. In making the presentation, Mr. P. N. Langford, the General Manager, referred to the enormous expansion of the undertaking since 1879, when Mr. Gibbons first joined the staff of the old Coventry Gas Company. In that year, he said, there were only 7000 consumers and 40 miles of mains; to-day there were 39,000 consumers and 212 miles of mains, and the annual output of gas had increased from 170 to 2200 million c.ft. In this development Mr. Gibbons had assisted to the utmost of his ability. His one object in life had been to further the interests of the Department.

Major F. MIDDLETON, who has been actively associated for many years with the Old Silkstone Collieries, Ltd., Dodworth, near Barnsley, as Managing Director, has been appointed Deputy Chairman of the Company and its Associated Companies, which include the Old Silkstone Chemical Works, Ltd., the Dodworth Estate Company, Ltd., the Goldthorpe Collieries, Ltd., the Garforth Collieries, Ltd., and the Allerdale Coal Company, Ltd.

In connection with the further development of the branches and workshops at Newcastle-on-Tyne and Belfast, the firm of Thomas Glover & Co., Ltd., dry gas meter makers, have sent their Mr. I. I. WHIMSTER as an additional representative in the North of England and the North of Ireland. Mr. Whimster has been connected with the firm for many years, and is well known to many who have visited the firm's Edmonton Works.

Major G. FETHERSTONE has resigned his appointment as British Trade Commissioner in South Africa, in order to take charge, as from the 1st inst., of the South African interests of the group of engineering firms controlled by Agricultural and General Engineers, Ltd., of Aldwych House, W.C.

OBITUARY.

The death took place, on Feb. 3, of Mr. JAMES LEE, who had been Secretary and Manager of the Longridge Gas Company for fifteen years. Deceased was a native of Heywood, and had held previous appointments at Carnforth and in Ireland.

The death occurred, on Jan. 23, of Mr. JOHN MILES, of Portslade. Though Mr. Miles had nearly reached his 82nd birthday, he was very active, and until last November enjoyed good health. He had been an employee of the Brighton and Hove General Gas Company for 62 years. He joined the Company in 1864, at the age of 19, and when the works were situated at Hove. Nine years later he was made carbonizing foreman, in which capacity he served till 1890, when he was appointed chief foreman of the works at Portslade. He occupied that position until 1920, when he became consulting foreman, with liberty to attend at the works at his own convenience. The Directors of the Company so appreciated his services that as recently as Christmas they presented him with a gold watch and chain, suitably inscribed, to commemorate his long service. His loss will be greatly felt by all connected with the Company.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Feb. 10.—MIDLAND JUNIOR GAS ASSOCIATION.—Reunion and dinner at the Imperial Hotel, Birmingham.

Feb. 12.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Swansea.

Feb. 12.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Joint meeting with Eastern District at Glasgow. Paper by Mr. T. Campbell Finlayson on "The Importance of Flexibility in Gas Manufacture."

Feb. 16.—INSTITUTION OF GAS ENGINEERS AND BRITISH COMMERCIAL GAS ASSOCIATION.—Joint Conference on "The Inspection and Maintenance of Consumers' Appliances," at the Institution of Mechanical Engineers, Storey's Gate, S.W.1.

Feb. 17.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting in Birmingham. Paper by Mr. Edgar Jones, of Derby, on "Drainage and Effluents from a Gas-Works."

Feb. 17.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, at 2.30.

Feb. 19.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Leeds. Paper by Mr. T. B. Browne, of the National Gas Engine Company, Ltd.

Feb. 25.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Paper by Mr. E. W. L. Nicol, entitled "Coke's Case."

Feb. 26.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. Pott, Cassels, & Williamson's Works, Motherwell.

March 4.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Twenty-fifth annual dinner at the Criterion Restaurant, W. 1.

March 8.—NATIONAL GAS COUNCIL.—Meeting.

March 8.—FEDERATION OF GAS EMPLOYERS.—Meeting.

March 9.—JUNIOR GAS ASSOCIATIONS.—Education Conference.

March 9.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of General Committee at No. 28, Grosvenor Gardens, S.W. 1.

March 16.—BRITISH COMMERCIAL GAS ASSOCIATION.—Midlands District Conference at Smethwick.

March 30.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Annual general meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15.

April 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual spring meeting at Dumbarton.

May 5.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring meeting at Ipswich.

May 5.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Annual meeting at Newcastle.

INSTITUTION OF GAS ENGINEERS.

June 14-17.—Annual General Meeting in London.

ELECTRICITY SUPPLY MEMORANDA.

Reception of the Chairman.

THE Electrical Press generally views with favour the appointment of Sir Andrew Rae Duncan, M.A., LL.B., to the Chairmanship of the new Central Electricity Board; and no doubt he will view with considerable approval the endorsement by our contemporaries of the selection made by Lt.-Col. Wilfrid Ashley, Minister of Transport. The "Electrical Review" looks with favour upon the evidence we have had of Sir Andrew's fairness, tact, breadth of vision, allied with energetic action and organizing ability, which should admirably fit him for the very responsible and onerous post that he has accepted. The "Electrical Times" says "the Government has probably saved the industry from the affliction of a Chairman determined to dominate the Commissioners—technically and financially—and to assert himself as dictator of the electric supply organization." In the opinion of this paper: "He seems likely to get the ship well under way, and to avoid the rocks." We are afraid there are many rocks which will have to be negotiated as the work develops. Both the "Review" and "Electrical Industries" wish the Chairman success in his new sphere of work, while the "Electrician" welcomes him, and looks hopefully to the future under his guidance. "Electrical Industries" states that the salary attached to the new position is £8000 a year—not one of H.M. Ministers, save the Lord High Chancellor, receives as much. We congratulate Sir Andrew. It is anticipated that an announcement as to the appointment of the other members of the Board will be made almost at any time now.

Flues which Work the Wrong Way.

Our electrical contemporaries do not like the correspondence on the subject of flueless houses, which has been published in "The Times," and to which reference has been made in the last two issues of the "JOURNAL." They seem to appreciate that there is much truth in what those who object to such houses have said, and so, for the most part, they refrain from comment. One such contemporary, however, does not agree that ventilation should be provided by flues; and it suggests that steps should be taken to discover some means of ventilation which will fit in with the new conditions, and still promote the savings which are possible when chimneys are not applied. If this discovery has still to be made, then it is a bit early to commence building houses with flueless rooms. However, that by the way. The ambition of the electricians is to transfer the expenses of building chimneys, &c., from the landlord of the house to the tenants by creating new expenditure for them—by giving them a more costly agent for heating, and by necessitating fitting-up in every room an electric fan, which installation would be expensive, and would involve the tenant in constant running expenses. Here we have a saving on the one hand, which promotes an outrageous expenditure on the other. The gas industry proposes to displace the ordinary chimney and its accessories by a flue of sufficient dimensions to carry away the products of combustion from gas-fires and for ventilation purposes. This is an automatic means of ventilation which does not run the tenants into any extra cost. One of the correspondents in "The Times"—and we think about the only one who has had anything to say in favour of the abolition of flues from rooms—is General W. Baker Brown, and one contemporary fastens on to what he says, apparently because it is of the opinion that it is excellent. We pity it. Our contemporary says the General pointed out "that the chimney is not a good ventilator—more often performing the function of bringing dust into the house than of taking microbes out." That is not precisely what General Baker Brown said. What he did say is: "On many days the draught is down the chimney—not up—bringing into the house accumulated dust, often laden with disease germs." Now we would suggest to our contemporary (which happens to be "The Electrician") that, if chimneys more often perform the function of bringing germ-laden dust into the house than of taking microbes out, it follows that more often than not chimneys, instead of taking away the products of combustion from fires, exercise some sort of back-pressure, and puff the smoke out into the rooms of the house. Really, it is wonderful what strange things some people will say in defence of a cause, even though it be a bad one. If we believe all some electricians assert, it is an extraordinary thing that any of us are alive; and it is still more remarkable that our biological tutors should be able to tell us that the average duration of life has extended. That extension was going on long before electric heaters came on to the market, and before flueless rooms were thought of in the interests of electric heating, and against the interests of health. We confess that we have greater faith in the views of men of the position of Mr. P. L. Waterhouse and Dr. Leonard Hill than we have of men who think that chimneys which for centuries have been built for the purpose of functioning upwards more often than not are actuating in the contrary direction.

Industrial Heating.

We are not so foolish as to say that there are no industrial circumstances in which electric heating has not some special advantage. It has where a high concentrated heat is required. Though in such cases it may be dearer, the result may be worth the extra money; but for general heating purposes in industrial operations, the relatively low efficiency of the generation of electric heat energy makes it impossible to compete with gas and coke. Mr. S. E. Monkhouse, of the Newcastle-upon-Tyne Electric Supply Company, recently read a paper on the subject at one of the Electrical Development Association conferences. We have frequently made the point in the "JOURNAL" that, while the Government have been so solicitous regarding the bringing of electricity generation to a comparatively few definite points about the country, in order to cheapen (as they think, but others dispute) the cost of power to industry, the provision of a convenient heating agent for industry and domestic purposes is really the more important matter in respect of our national economy. In the paper by Mr. Monkhouse, he made the interesting statement that the amount of fuel consumed per annum for industrial purposes in America, other than for motive power, is about 2·2 times the quantity used for purely motive power purposes. Of course, it may be that this ratio would not apply to this country; but anyone who gives even superficial thought to the subject must admit that the amount of fuel used for heating is enormously greater than that required for power. Another point in the paper, which is of considerable interest in relation to the fuel developments of the times, is that the Company with which Mr. Monkhouse is connected allocated an engineer some months ago to promote and supervise exclusively their industrial electric heating business. The Company did wisely in selecting a technically trained man to undertake this particular work, in view of the fact that no real progress can be made with it unless the person in charge is able to deal with it not only from the pounds, shillings, and pence point of view, but can give to it all essential technical consideration. Arising out of this, we find that the investigations of the engineering representative have convinced him that there must be considerable propaganda if the business is to be stimulated in favour of electricity. That finding does not in the least surprise us.

"Superiority" of Electricity.

However, Mr. Monkhouse does not agree that the industrial heating business will be developed if electricity is sold at a price which is competitive on a heating basis with that ruling for other classes of fuel. It must, he confesses, be at an economic price; but supply engineers will require to discriminate between a competitive price on a heating basis and an economic price. We know what he has in mind. In recommending that no effort should be made by supply authorities to obtain industrial heating on a purely competitive basis, he acts wisely. What they have to do is to rub-in the fact of the so-called superior merits of electric heating, in order to make the manufacturers wish to obtain by it advantages which are supposed to be non-existent when using some other form of fuel. The manufacturer will be very particular to ensure that those other "advantages" have material existence. If he is satisfied on that point, and obtains assurance that he is not purchasing them too dearly, he will be pleased enough to welcome electricity into his service. Unfortunately for electricity, the manufacturer has to pay less for therms in the gaseous form; and, further, the advantages which are enumerated in the paper as being obtained from the use of electricity, are also present in the use of gas. Mr. Monkhouse claims a specially high efficiency for electrically heated furnaces when working at temperatures of between 400° and 500° Fahr. He also finds that there is a saving in labour, freedom from spoilage and rejects, the finished products are invariably of standard quality, furnaces heated by electricity are easy of control, there is uniform heating, and no coal or ashes to be handled. It is submitted by the author that the savings from these things more than justify the adoption of electric heating. Yet all those "advantages" are found with gas, by which a higher thermal value is obtained for a given expenditure.

Some Applications.

Mr. Monkhouse cited a number of industrial applications of electricity—for instance, the annealing of tool steel. In the case referred to, a 2½-ton furnace is used; and he says the owners report that it has improved their working considerably, and the cost is about the same as for the superseded furnace. Electricity is also being applied to linseed oil boiling, and to bitumen heating—the heating being done at night time. It is also used for paint drying; and mention was made of vacuum drying ovens, which are heated by steam during the day and by electricity during the night. This indicates that the electricians are looking-out for manufacturing operations by which electricity can be used at night, when they are glad enough to get custom at any price. The author also gave examples of

American experience, and states that electricity has produced there either reduced costs or some other improvement. In a case of wire annealing for nails, he says the cost has been reduced by 50 p.ct.; and a like reduction has been made for brass melting. But a strange thing about these performances is that no concrete particulars are given—for example, as to charges, which we often find require, in the case of electricity, a microscope to make them visible, while gas is put at some absurd figure, showing either that the gas supplier is incompetent and deserves to lose the business, or that the figure is only an assumed one. It is a pity there is so much secrecy about the prices paid for electric current for manufacturing work. Numerous papers have been published in the gas industry in which costs have been fully set out; but the electrical people appear to be peculiarly shy. Mr. Monkhouse suggested that the Electricity Commissioners should appoint a Committee to inquire into industrial processes—the same as the Committee who recently reported to the Commissioners on the subject of development in domestic electrification. If the suggested Committee's report on industrial heating contained the same measure of novelty as the report on domestic development, it would be barren of material for comment or criticism.

CONFERENCE ON MAINTENANCE.

Programme of the Meeting.

The Joint Conference of the British Commercial Gas Association and the Institution of Gas Engineers, on "The Inspection and Maintenance of Consumers' Appliances," will be held at the Institution of Mechanical Engineers, Storey's Gate, at 11.30 a.m., on Wednesday, Feb. 16. The chair will be taken by Mr. JOHN E. COWEN, J.P.

The following is the programme of the proceedings:

Opening remarks by Chairman.

Statement by the Chairman of Executive, "B.C.G.A." (Mr. F. W. Goodenough), who will move the following resolution, which will be seconded by Mr. W. J. Sandeman, who will also give an account of the Croydon system:

> That in the opinion of this Conference an efficient system of periodical inspection and maintenance of the gas appliances in all consumers' premises (backed by a constant supply of gas adequate to meet the maximum demand) is essential to the permanent prosperity and future progress of the gas industry, and to the complete fulfilment of its duties to the community; and that to this end every possible facility and encouragement should be given for the education and training of the personnel necessary for carrying out the work entailed.

Discussion on the foregoing and on information contained in the papers and discussions set out in the appended list. [*See also "Supplement" to the "GAS JOURNAL," Feb. 2, 1927.*]

LIST OF PAPERS AND DISCUSSIONS

on the subject of Maintenance and Inspection of Consumers' Appliances.

Title.	Reference.
"Maintenance of Consumers' Appliances," by Mr. George Keillor, of Greenock	"GAS JOURNAL," April 8, 1925.
"Maintenance of Domestic Consumers' Appliances and Fittings — Administrative Policy of Gas Undertakings," by Mr. J. W. Napier, of Alloa.	"GAS JOURNAL," April 8, 1925.
"Maintenance," by Mr. J. W. McLusky, of Glasgow	"GAS JOURNAL," April 15, 1925.
Discussion on "Maintenance" at meeting of North British Association of Gas Managers.	"GAS JOURNAL," April 22, 1925.
"All-In Policy of Maintenance," by Mr. P. E. Browne, of Brighton.	"GAS JOURNAL," Dec 23, 1925.
"Service to the Consumer," by Mr. J. W. McLusky, of Glasgow, and Mr. W. B. McLusky, of Halifax	"GAS JOURNAL," Sept. 29, 1926.
"Commercial Value of a Census of Consumers' Premises and the Inspection and Maintenance of Appliances," by Mr. H. H. Creasey, of London	Copy of paper read and discussion at "B.C.G.A." Conference at Newcastle, October, 1926, to be circulated at the meeting.
"Practice at Newcastle-on-Tyne".	See pp. 58-61 of discussion on Mr. Creasey's paper as above.
"Maintenance of Consumers' Appliances and Fittings," by Mr. A. J. Garward, of Portsmouth	"GAS SALESMAN," Jan. 12, 1927.
"The Development of a Complete Maintenance Scheme," by Mr. C. H. Rendell, of London	"GAS SALESMAN," Jan. 12, 1927.

SOCIETY OF CHEMICAL INDUSTRY.

Fuel Section.

There will be a Joint Meeting of the Yorkshire Section of the Society of Chemical Industry and the Fuel Section at the Queen's Hotel, Leeds, on Monday, Feb. 28, from 2.30 to 7, with an interval for tea at 4.30. The technical programme is as follows:

"The Influence of Furnace Atmosphere on the Rate of Scalding of Iron" Part I., C. B. Marson and J. W. Cobb. Part II., H. T. Angus and J. W. Cobb.

"A Thermal Study of the Water Gas Process." A. Parker.

"A Study of Coke Formation." R. A. Mott.

"The Behaviour of Cokes in the Open Grate." Margaret F. Bligh (formerly Eurich) and H. J. Hodsman.

"Coke in Relation to some of its Industrial and Domestic Uses." H. Hollings.

Any of our readers who desire further particulars should communicate with Mr. H. J. Hodsman, Fuel Department, the University, Leeds.

BRITISH INDUSTRIES FAIR, CASTLE BROMWICH.

The demands for gas at the forthcoming British Industries Fair (Castle Bromwich Section) are far in advance of anything required in previous years. Last year the gas used in the various fair buildings was metered through a primary 2000-light cylindrical meter; but it was apparent that the consumption this year would be in excess of such a meter's capacity. It was decided, therefore, to dispense with that meter, and to pass the gas direct from the service through a rotary compressor capable of delivering 20,000 c.ft. per hour. Appropriate sized meters are then fixed for the individual exhibiting firms, and all gas consumed will be separately metered, except that used in the high-pressure lamps. The gas, now at a pressure of 26 in. water column, is discharged through a 6 in. cast-iron outlet pipe approximately 600 yards in length, from which branches are taken to supply the various buildings.

To meet the needs of Building "A," a 4-in. branch is taken from this 6-in. outlet; and the gas is led through a 4-in. governor, which reduces its pressure to 4 in. water column. At the outlet of the governor the supply is split; a 3-in. pipe being run to supply the large kitchens of the catering firm, while a second 3-in. pipe supplies the requirements of those exhibitors whose stands are in that building. From this second 3-in. supply a branch is also taken to two 1000 c.ft. per hour rotary compressors, in which the gas is raised to 5 in. mercury pressure for supplying the high-pressure lamps used for the general lighting of the building. From the main 6-in. outlet, 4-in. branches are taken off to supply Buildings "B" and "C;" the gas passing through governors, where the pressure is reduced from 26 in. to 4 in., in the same way as is done in Building "A." Two 4000 c.ft. per hour Bryan-Donkin rotary compressors are fitted in Building "BB;" and these supply gas at 5 in. mercury column to the high-pressure lamps lighting Buildings "B" and "BB."

In Building "B" is the stand of the City of Birmingham Gas Department Industrial Research Laboratories. This exhibit will consist of two large-size gas-heated oven furnaces, working under practical conditions on the heat treatment of forgings. The oil in the quenching bath is passed through a Heenan and Froude cooling plant. With a view to showing the relationship between heat treatment work and testing, a range of tensile testing, impact testing, and Brinell testing machines will be arranged on another part of the stand; and all work being treated will be tested. Other interesting exhibits on the stand will include a complete range of temperature measuring apparatus, and several smaller gas furnaces and industrial gas apparatus.

Messrs. Gibbons (Dudley), Ltd., Dibdale Works, Dudley, will have in the same building an interesting stand showing large gas heated furnaces under working conditions.

In Building "C" there are the second large cooking kitchens and dining-rooms. Here, as in Building "A," gas is the only heating agent used for cooking and the provision of hot water.

COMMERCIAL GAS COMPANY.

Annual Report and Accounts.

The following is the report, for the year ended Dec. 31 last, which the Directors of the Commercial Gas Company will present at the meeting of shareholders on Feb. 17.

The revenue account shows a profit for the year of £132,041 12s. 2d., which, together with the balance of £39,436 4s. 9d. brought forward from the previous year, makes a total of £171,477 16s. 11d. After providing for the payment of dividends for the June half-year at the rates of £5 6s. 8d. p.ct. per annum on the 4 p.ct. stock, and £5 3s. 4d. p.ct. per annum on the 3½ p.ct. stock, and for the debenture and other interest, there remains a balance of £93,722 5s. 5d., out of which the Directors recommend the payment of dividends for the December half-year at the rates of £5 6s. 8d. p.ct. per annum on the 4 p.ct. stock, and £5 3s. 4d. p.ct. per annum on the 3½ p.ct. stock, both less income-tax.

The Directors are pleased to announce that, notwithstanding the prolonged coal stoppage, the supply of gas in the Company's area was fully maintained, as regards both quality and pressure. Large quantities of foreign coal had to be purchased at greatly enhanced prices, which necessitated raising the price of gas from 9·4d. to 9·8d. per therm as from midsummer, and to 10·4d. per therm as from Christmas last.

An application was made to the Board of Trade for a revision of the standard price under section 1 of the Gas Regulation Act, 1920, in accordance with the provisions of the Gas (Amending Orders) Rules, 1926; and an Order was made on Sept. 28, 1926, increasing the standard price from 11·4d. per therm to 12d. per therm until June 30, 1927. Subsequently, on a further application, an Order was made on Dec. 23, 1926, repealing the previous Order and increasing the standard price to 12·6d. per therm until Dec. 31, 1927.

The Directors regret that, owing to the pressure of other engagements, the Hon. Kenneth Mackay has found it necessary to resign his seat on the Board. In conformity with the Acts of Parliament regulating the Company, they have elected Mr. Charles Carpenter, C.B.E., D.Sc., M.Inst.C.E., to the vacant Directorship, and have great pleasure in announcing that he has accepted the vacant seat.

A Bill in Parliament has been deposited: "To make new provision as to the charges for the gas supplied by, and the application of the profits of, the Commercial Gas Company; and for other purposes." The Bill will be submitted for the approval of the proprietors at an Extraordinary Meeting to be held immediately ofter the close of the Ordinary Meeting.

Sir Frederick Green, K.B.E., and Messrs. Stanley Hunter Jones, M.Inst.C.E., and Charles Carpenter, C.B.E., D.Sc., M.Inst.C.E., three of the Directors, retire by rotation, and, being eligible, offer themselves for re-election. Mr. B. W. Ellis, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

WILLIAM GRAHAM BRADSHAW,
Chairman.

Gas-Works, Stepney, Jan. 20, 1927.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on Dec. 31 last amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £254,298 remained unissued out of the total authorized capital (including premiums) of £2,340,000. The total amount borrowed at this date was £339,062 10s., and £135,937 10s. was added by conversion, making a total of £475,000, and leaving £114,226 to be borrowed, out of the £585,000 authorized. The capital account receipts amount (with premiums) to £2,606,065.

The expenditure stands at £1,563,731, with a nominal amount of £1,212,812—together £2,776,543. There is thus a balance of £170,478 carried to the balance-sheet. A sum of £32,519 was expended during the year; but £11,679 was credited for mains, services, and steamships.

The reserve fund amounted at the close of the year to £62,397, and the insurance fund to £37,490.

The following is the revenue account:

Receipts.

Sale of gas—			
Per meter (number in use, 117,464) at 9·4d. and 9·8d. per therm	£732,432 13 6		
Public lighting and under contracts	12,026 1 1		
		£744,458	14 7
Rental—			
Meters (26,115)	£9,187 2 0		
Stoves (116,720)	42,461 6 4		
Prepayment meters and fittings (90,822)	56,380 17 4		
Maintenance of mantles and fittings	1,446 0 9		
		109,475	6 5
Residual products—			
Coke	£231,693 12 6		
Breeze	10,061 1 1		
Tar	45,731 6 2		
Ammoniacal liquor and sulphate of ammonia	19,714 3 5		
		310,200	3 2
Miscellaneous receipts—			
Rent receivable	£1,047 12 1		
Transfer fees	70 2 6		
		1,117	14 7
Total receipts		£1,165,251	18 9

Total wages paid in 1913, £119,010
" " 1926, £262,556
Total salaries paid in 1913, £22,976
" " 1926, £65,220

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£490,176 18 4		
Salaries of engineer and officers at works	12,543 13 2		
Wages (carbonizing)	46,669 5 1		
Purification, including labour	7,835 11 6		
Repair and maintenance of works and plant, materials and labour (less £1931 5s. 8d. received for old materials)	161,775 6 6		
		£719,000	14 7
Profit sharing		9,848	0 8
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£27,308 14 11		
Repair, maintenance, and renewal of mains and services, material and labour	38,852 2 7		
Repair and renewal of meters	10,066 0 0		
" " " " stoves	57,805 17 1		
" " " " prepayment meters and fittings	41,671 10 11		
Maintenance of mantles and fittings	3,008 6 11		
		178,712	12 5
Public lamps—lighting and repairing		6,674	1 7
Rent, rates, and taxes		44,148	13 6
Management—			
Directors' allowance	£4,750 0 0		
Company's Auditors	150 0 0		
Salaries of General Manager and Secretary, Accountant, and clerks	6,736 11 6		
Collectors' salaries and commission	5,595 17 10		
Prepayment meter collection	18,047 7 1		
Stationery and printing	4,319 12 8		
General charges	8,664 3 6		
		48,263	12 7
Bad debts		471	15 5
Law and parliamentary charges		1,062	7 10
Superannuations and Allowances, and Workmen's Benefit Society, &c.		19,493	17 9
Official officers, &c.		301	2 0
National Health, Pensions, and Unemployment Insurance		5,233	8 3
Total expenditure		£1,033,210	6 7
Balance carried to net revenue account		132,041	12 2
		£1,165,251	18 9

Statement of Coal and Oil.

—	In Store Dec. 31, 1925.	Received During Year.	Carbonized During Year.	Used and Sold During Year.	In Store Dec. 31, 1926.
Coal—tons	32,555	249,656	249,697	685	31,829
Oil—gallons	394,708	1,258,519	1,140,722	40,911	471,594

Statement of Residual Products.

Description.	In Store Dec. 31, 1925	Made During Year.	Used During Year.	Sold During Year.	In Store Dec. 31, 1926.
Coke—tons	7,805	168,546	19,710	150,806	5,835
Breeze—tons	2,265	22,679	..	23,756	1,188
Tar—gallons	488,583	2,325,266	..	2,288,728	525,121
Ammoniacal liquor—butts of 108 gallons	13,736	87,801	85,929	692	14,916
Sulphate of ammonia—tons	145	2,812	..	2,831	126

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Therms. 21,308,923	Therms. 165,452	Therms. 19,662,868	Therms. 20,147,952	1367

The final statement is the balance-sheet, which gives the value of the stores in hand at the close of the year as follows: Coal, oil, &c., £61,898; coke and breeze, £6149; tar, ammoniacal liquor, sulphate of ammonia, &c., £13,210; and sundry stores, £50,643—total, £131,901. The figures a year ago were: Coal, oil, &c., £48,883; coke and breeze, £6151; tar, ammoniacal liquor, sulphate of ammonia, &c., £13,181; sundry stores, £55,221—total, £123,437.

History of Artificial Lighting.—For the paper which he read on this subject last October, Captain W. J. Liberty (Hon. Secretary of the Institution of Public Lighting Engineers) has been awarded by the Council of the Society of Engineers the "Nursey Premium." This was presented to him at the inaugural meeting of the Society for the present session, which was held at Burlington House, Piccadilly, last Monday.

Institution of Public Lighting Engineers.—In connection with the annual general meeting and conference to be held at Brighton from Sept. 12 to 15, it is proposed to have an exhibition of street lighting appliances (electric, gas, or other illuminant). Firms desiring to take part in this should make application to Mr. Alex. C. Cramb (President-Elect of the Institution), Electric House, 38, High Street, Croydon, Surrey, stating their requirements as to floor space, and if they need a supply of gas or electricity in connection with their exhibit.

THE ROYAL SOCIETY.

A Synopsis of Papers read on Thursday, Feb. 3.

W. A. Bone, F.R.S., R. P. Fraser, and D. A. Winter. The Initial Stages of Gaseous Explosions. Part I.—Flame Speeds during the Initial "Uniform Movement."

The paper embodies the results of an experimental investigation upon the nature of the initial movement of flame when a gaseous explosive mixture is ignited at the *open* end of a horizontal tube 2·5 cm. in diameter. It is especially directed towards a better understanding of what is usually known as the "uniform movement" in such circumstances. The explosive mixtures examined have been chiefly hydrogen-oxygen, ethylene-oxygen, and acetylene-oxygen mixtures.

It is shown, in such cases, that, so long as the initial flame speed does not exceed about 4000 cm. per second, there is a definite initial "uniform movement," the speed of which, under standard conditions of experiment, was nearly always fairly constant. But with initial flame speeds exceeding such limits, ethylene-oxygen and acetylene-oxygen mixtures no longer showed any "uniform movement" at all. On the contrary, the flame speed was continuously accelerated *ab initio* until detonation was set up, just as though the explosive mixture had been fired near the *closed* end of the tube.

In the case of hydrogen-oxygen mixtures, while the uniformity of the initial movement was still maintained, its speed tended to vary considerably in successive experiments, even though, as far as can be judged, all conditions were kept the same—so sensitive are such fast-burning mixtures. Other experiments showed that, in certain circumstances, a slow "uniform movement" of flame can be developed in an explosive mixture after an initial period of continuous acceleration. Therefore, it would seem that the speed at which a slow uniform flame movement can travel through an explosive mixture cannot be regarded as a physical constant of it, in the same sense as its rate of explosion (that is, detonation).

W. A. Bone, F.R.S., R. P. Fraser, and D. A. Winter. The Initial Stages of Gaseous Explosions. Part II.—An Examination of the Supposed Law of Flame Speeds.

This paper embodies the results of a systematic experimental testing, by the method of blending, of the "law of flame speeds" propounded by Prof. R. V. Wheeler and Dr. W. Payman in 1922, which says that, "given two or more mixtures of air or oxygen with different individual gases, in each of which the speed of propagation of flame is the same, all combinations of mixtures of the same type (*i.e.*, all containing excess of oxygen or all containing excess of combustible gas) propagate flame at the same speeds, under the same conditions of experiment."

The mixtures used for the tests have included several complex hydrocarbon and hydrogen-oxygen mixtures, in which the hydrocarbon has been either acetylene, ethylene, or methane. Also a series of complex methane-hydrogen-air mixtures, all containing excess of combustible gas, has been examined. In no case have the requirements of the "law" been fulfilled.

In cases in which ethylene or methane was the hydrocarbon used, and the primary mixtures both contained excess of combustible gas, it has been shown experimentally that the effect of successive additions of the primary hydrogen-oxygen mixture to the primary hydrocarbon-oxygen mixture (both having the same initial uniform flame speed) is progressively to depress the initial uniform flame speed of the resulting complex mixture, until it refuses any longer to propagate flame. It therefore follows that, whatever measure of truth there may be in Payman and Wheeler's conclusions in regard to particular instances, they are not generally applicable to gaseous explosions, and cannot be vested with the authority of a natural law.

W. A. Bone, F.R.S., and A. Forshaw. Studies upon Catalytic Combustion. Part V.—The Union of Carbonic Oxide and other Gases with Oxygen in Contact with a Fireclay Surface at 500° C.

Experiments are described in regard to the action of a fireclay surface in catalyzing the combustion of carbonic oxide and other gases at 500°, which lead to the following conclusions:

(1) That the surface catalyzes the combination of (moist) carbonic oxide and oxygen much in the same way as it does that of hydrogen and oxygen at the same temperature, though in a less degree.

(2) That, with a moist mixture of the carbonic oxide and oxygen in their combining proportions, the rate of combination is always directly proportional to the pressure of the dry mixture, provided that the surface is in a "normal" condition, and the reaction product quickly removed from the system.

(3) That the catalyzing power of the surface can be greatly stimulated by previous exposure at the reaction temperature to the combustible gas. The stimulus so imparted is not, however, permanent, but gradually dies away after the exciting cause is removed. It may also be removed by exposing the surface to oxygen at the reaction temperature. Indeed, an oxygen-treated surface becomes either "normally" active or only slightly more so, according to conditions.

(4) That when the carbonic oxide and oxygen are present in other than their combining proportions, their rate of combination is proportional to the partial pressure of the carbonic oxide, which thus becomes the controlling factor in the process.

(5) That of hydrogen, carbonic oxide, and methane, the first-named is the most, and the last-named the least, amenable to the catalytic combustion.

CONTINUOUS CARBONIZATION IN GLOVER-WEST VERTICAL RETORTS.

Since the last announcement in November, West's Gas Improvement Company, Ltd., have booked several interesting contracts.

The Urban District Council of Colwyn Bay have decided to instal plant of a daily capacity of 1¼ million c.ft. of gas, together with coal handling plant which will enable coal wagons to be discharged on the railway sidings and the contents conveyed either direct to the retort house or to a coal store which is to be built alongside, forming an extension of the existing buildings. Coal and coke is to be handled within the retort house by means of the West lip-bucket conveyor; the coke being delivered to a storage hopper with screens at the end of the retort house.

At Belfast, it has been decided to proceed with the remodelling of the existing installation, the first stages of which were inspected by the Institution of Gas Engineers during the Presidency of Mr. J. D. Smith in 1923. The reconstruction of the "A" and "B" benches then undertaken resulted in increasing their daily production from 2½ to 5 million c.ft.; and the result is so satisfactory that orders have now been given for the remodelling of "D" bench, the capacity of which was equal to that of "A" and "B" put together. This, of course, is equivalent to an extension of the carbonizing plant by 2½ millions on the same site, and without any increase in the labour charges.

The Tokio Gas Company have placed an order for an installation of 4½ millions daily capacity. This plant is being specially designed with a view to minimizing the risks of damage due to earthquakes. It has already been reported in these columns that, while the Glover-West installation erected at Tokio in 1910-11 withstood the ravages of the earthquakes of 1923, the second installation suffered heavily. During their visit to Manchester in 1925, the Engineers of the Tokio Gas Company discussed this problem with West's Gas Improvement Company; and the designs now accepted are based upon their suggestions.

The Bury Corporation have decided to increase their Glover-West vertical retort installation by the addition of eight retorts on the new model. The work is to be carried out this year, together with the resetting of three of the original beds after 4½ years' working.

The Tipton undertaking has placed the order for the remodelling of a further eight retorts on the same lines as the sixteen retorts which were remodelled in 1923. This, again, is tantamount to an extension of the plant by adding 250,000 c.ft. to its daily capacity.

The Earby and Thornton Gas and Lighting Company, whose works are near Colne, in Lancashire, have accepted a tender for the construction of Glover-West vertical retorts of a daily capacity of 250,000 c.ft.

Last week the West Bromwich Town Council approved the recommendation of the Gas Committee that an installation of Glover-West vertical retorts to produce 1½ million c.ft. of gas a day be erected; and it was decided to apply to the Ministry of Health for sanction to borrow the necessary capital. This installation will be fully equipped with coal and coke handling machinery, and with building and foundations arranged for subsequent extension to a plant of 3 millions daily capacity.

Abroad, West's Gas Improvement Company of America (Inc.) have secured a contract for the construction of further plant at Springfield (Mass.) of 2¾ millions daily capacity; and the Cie. Gle. de Construction de Fours have in hand installations of Glover-West vertical retorts at Blois and La Rochelle for about 600,000 and 1,200,000 c.ft. daily production respectively.

APPLICATIONS OF POWER ON GAS-WORKS.

By HAROLD CHARLES SMITH, Assoc.M.Inst.C.E., of Tottenham.

[Abstract of a Paper brought forward for discussion at the Institution of Civil Engineers on Feb. 8.]

After a brief mention of the uses of pneumatic, hydraulic, and gas power, the applications of steam on a gas-works with an output of more than 15 million therms per annum are detailed. In manufacturing this gas approximately 148,000 tons of coal and 2,700,000 gallons of gas oil are used. Some 87,000 tons of coke and breeze are obtained as a bye-product, of which 18,500 tons of coke are used for the manufacture of water gas, and 8600 tons of coke and 26,700 tons of breeze as boiler fuel. The steam generated on an average day is shown to be at the rate of 44,110 lbs. per hour from and at 212° Fahr., or 16,718 H.P. The cost of generation, exclusive of capital charges, but including fuel, labour, water, repairs, and maintenance, is shown to be 11·3d. per 1000 lbs. of steam, or 25·3d. per ton.

The boilers in which this steam is generated are described; their actual outputs being compared with their rated capacities. Five waste-heat boilers are included in the boiler plant. The boiler efficiencies and load-factors are stated. The quantity of steam generated is allocated in the following manner to the various pieces of plant and machinery for which it is used:

	Lbs. per Hour from and at 212° Fahr.
Carburetted water gas	3,458
Steaming vertical retorts	1,581
Generating electricity	4,022
General power purposes	33,105
Boiler grates, ejectors, &c.	1,944
	44,110

From the balance drawn-up between the steam generated and the H.P.-hour output obtained by its use, the efficiency of transmission of energy from heat in steam to B.H.P.-hours is shown to be 3·5 p.ct. This low efficiency is due to the fact that steam is used in a large variety of scattered units, the majority of which have been in use for several years, and are working under non-condensing conditions.

The saving in labour to be effected by linking-up the whole of the boiler plant, and by converting certain of the hand-fired boilers to mechanical stoking, is shown to be £790 per annum on a capital outlay of £1810. This saving is in addition to any saving in fuel due to the levelling-up of the load and to the increase in the proportion of steam made on mechanically-operated boilers and waste-heat boilers.

The generation and use of electrical power on a gas-works is dealt with. The efficiency of the generation of electricity from heat in steam supplied to engines to heat in electricity generated is shown to be 10·1 p.ct.; and the efficiency of the generation and transmission of electricity from heat in steam supplied to engines to B.H.P. developed on works motors is shown to be 6·1 p.ct., which is comparable with the efficiency of 3·5 p.ct. given for the use of steam power.

Of the 16,718 H.P. of steam generated, 2647 H.P. is used for gas making and purposes other than power, and 14,071 H.P. for power purposes. Of the latter 1524 H.P. is converted into electrical energy, giving 147·8 H.P. of electricity.

The author suggests that, in designing a new gas-works of a similar size to the one under review, power would be most economically produced and applied as electricity. This could be generated by steam at a central station; the bulk of the steam being produced by waste-heat boilers. Instead of steam being used in small units at scattered points, it would then all be used at one point; the exhausts of engines using it discharging into suitable condensing plant.

Assuming that the mean total power required on a new works would be the same as on the existing works, 494 B.H.P. would be required on an average day. If this were applied as electricity with an efficiency from steam to motor of 6·1 p.ct., it would be necessary to generate only 8098 H.P. of steam instead of 14,071 H.P. as at present. A plant capable of generating 818 H.P., or 610 KW., would be required. With this plant, a higher efficiency should be obtained than on the 150-KW. plant now in use; and assuming this to be 14 p.ct., the steam required would be only 5843 H.P. The saving in steam would amount to 233 tons per diem, which, at 25·3d. per ton, gives a saving of £8963 per annum.

If only 5843 H.P. of steam were required, instead of 14,071 H.P. as at present, it is shown that it would be possible to make 83 p.ct. of the steam required on the works for gas making and power purposes (apart from that necessary for the working-up of bye-products) in waste-heat boilers under average-day conditions. Under existing conditions, it would only be possible to make 42·1 p.ct. of the steam required from the waste heat of the various carbonizing processes.

The works produce 3000 million c.ft. of gas per annum, having a calorific value of 500 B.Th.U. per c.ft. Of this production 25 p.ct. is water gas. To make this gas, 148,000 tons of coal are required. From each ton of coal carbonized 950 lbs. of steam from and at 212° Fahr. can be raised by waste-heat boilers. This equals 385,000 lbs. per diem. A quantity of 30 lbs. of steam per 1000 c.ft. of carburetted water gas, which equals 61,000 lbs. per diem, can also be raised. Therefore the total steam available from waste heat is 446,000 lbs. per diem. The requirements under present conditions equal 44,100 × 24 = 1,058,640 lbs. per diem. Therefore the proportion that can be raised from waste heat is 42·1 p.ct.

Assuming that the whole of the power requirements were supplied as electricity generated at an efficiency of 14 p.ct., the requirements for power would be 5843 × 24/0·379 = 370,000 lbs. of steam per 24 hours. In addition, 167,600 lbs. are required for gas making and other purposes, making a total of 537,600 lbs. Under these conditions, 83 p.ct. of the total requirements could be met by waste heat.

No comparison is made between the capital costs to be incurred by supplying the power requirements of a new works by means of steam and electricity as at present, or alternatively by means of steam-generated electricity only.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

At this meeting Mr. A. Hugh Seabrook read a paper—stimulating in parts, disappointing in others—on the relationship of gas and electricity undertakings. His view is that in the future electricity will be generated from steam raised by pulverized fuel. Electricity stations may adopt the system of low-temperature pre-treatment of the pulverized fuel, for the recovery of bye-products; and he thinks it may pay gas undertakings to purchase the gas so produced. A further aspect of co-operation lies in the generation of electricity by gas-works surplus heat. Electricity so generated could be sold by the gas undertakings to the Electricity Board. He urges that co-operation is essential.

A Meeting of this Association was held in the Westminster Technical Institute on Friday, Jan. 28, under the presidency of Mr. ARTHUR BROADBENT, of the Gas Light and Coke Company.

The CHAIRMAN remarked that five years ago Mr. Seabrook had read a most interesting paper which led to an excellent discussion; and doubtless their present meeting would be equally valuable. They had certainly looked forward with great pleasure to having Mr. Seabrook with them again. Their lecturer was a master of his subject. He had been engineer of two large electricity generating stations in London, and could speak with authority; and he, in common with many others, saw the necessity for co-operation between the two forms of light, heat, and power—gas and electricity.

GAS-WORKS AND THE PRODUCTION OF LIGHT, HEAT, AND POWER.

By A. HUGH SEABROOK, M.I.Mech.E., M.I.E.E., M.I.Gas E.

It seems hardly possible that it was so long ago as Jan. 27, 1922, that I last had the pleasure of meeting your Association on this subject; and looking up the proceedings of that evening, it is interesting to see in what direction things have developed during the past five years.

DISAPPOINTING PROGRESS.

The progress of the principle of the supply of gas and electricity from the same works has been distinctly disappointing. I think in only three cases has this been carried out by companies, and in not more than three or four by local authorities. The combined gas and electricity undertakings that were started some years ago appear to be flourishing, both financially and commercially.

The three undertakings referred to that are now in their second and third years of operation are Crowborough, Oakham, and Swanage. All three work under Gas and Electricity Acts of Parliament. The results in every case, I believe, are satisfactory to the proprietors. Some of the older combined undertakings are obtaining increased areas of supply, either by Special Act or by Special Order; and it is to be assumed, therefore, that the operation of these undertakings has been satisfactory in the view of the Government authori-

ties controlling these enterprises—otherwise the companies would not have been granted the additional territory.

The progress with local authorities has been just as slow as with companies. The most important combined undertaking which we hope will be inaugurated next month is that of the Retford Corporation, which is a straight gas, electricity, and water undertaking, under one General Manager; the electricity plant operated by gas engines working on town gas, and situated at the gas-works. Considerable alterations and additions to the water undertaking are under contemplation; and it is most probable that the pumps will be driven by automatically controlled electric motors—a method which is now becoming common practice both in sewerage works and in water works. The Retford undertaking will also be interesting to gas engineers because the lighting load demand for electricity will be supplied from a gas-works waste-heat boiler operating a steam-driven electric generator.

One or two other combined municipal gas, water, and electricity undertakings are about to be started-up; but in accordance with the policy of the Government, electricity will not be generated locally, but will be purchased in bulk from neighbouring power companies or local authorities possessing a large generating station. In the case of Retford, a bulk supply could not be obtained at a reasonable price; and in consequence local generation was permitted.

MR. CLARRY'S BILL.

Since I had the pleasure of meeting your Association in 1922, an important Act of Parliament, sponsored by Mr. Clarry, was passed, enabling statutory gas undertakings to apply to the Electricity Commissioners for Special Orders for supplying electricity, in the same way that any other company, body, or person can proceed. Previous to the passing of this Act, statutory gas companies were debarred from proceeding other than by a Special Act of Parliament.

The new Electricity Supply Act of 1926 also contains a special section dealing with statutory gas undertakings and the supply of electricity; but I think that this section will be of little assistance to gas undertakings, and that anyone who reads it will come to the same conclusion.

Many people thought that, by the passing of Mr. Clarry's Act, a "fillip" would be given to the principle of combining gas and electricity supply under one ownership; but it appears, as was seen in the well-known Horley Bill, that the application of a gas company for electricity powers is not regarded favourably by Parliament if there is any other company or person prepared to supply electricity in the same area, and maintain competition between the two agencies. Those of you who followed the proceedings in the Horley Gas and Electricity Bill will have noted that the Electricity Powers sought by the Company were granted by a Committee of the House of Lords, but refused by a Committee of the House of Commons, purely, I believe, on account of representations made to the latter Committee as to the policy the powers-that-be considered should be followed. That procedure has practically put a "stopper" on the combination of gas and electricity supply.

LIMITED SCOPE FOR COMBINED SUPPLY.

The policy abroad is much the same as it was in 1922—viz., it is usual for the supply of gas and electricity to be under the same proprietors, and distributed over very large areas of country. Notwithstanding this, in this country it has been deemed desirable to maintain separation of the two, and encourage competition between them. The scope for combined gas and electricity supply is also becoming much more limited. The country is rapidly being covered by electricity supply authorities, company and municipal. Last year an Electricity Bill was passed by Parliament giving electricity powers to a company over three whole counties, and this year there are two Bills before Parliament, which will most likely be passed, each covering by statutory electricity powers three or more counties. Another Bill is seeking for electricity powers for one county; and within twelve months there will be few districts in England, Wales, and Scotland that are not statutory areas of supply of electricity by companies, local authorities, or joint electricity authorities. It will be noted, however, that in new Electricity Bills stricter clauses are being inserted dealing with the possibility of an authority obtaining a big area for electricity supply, and not developing it. In the past it has been possible for a district to be "sat upon," as it were, for 20 years and upwards by some company having the power to supply electricity, but not doing so, at the same time keeping anybody else out who wished to carry on the business. A time limit of two or three years is generally prescribed, and provision is frequently made for cancelling the powers over an area, or any part of it, that has not been developed electrically within that time, and the granting of the area, or part of the area, to some other body who is prepared to do it.

However, I still believe that the future holds out great possibilities for co-operation between gas and electricity; and I will give my reasons for so thinking. In the Electricity Supply Act of 1926 there is a significant section, No. 23, worth the attention of all engineers and others interested in the conservation of fuel and energy. It is headed "Power of the Board to Purchase Surplus Energy;" the Board being the Central Board set up under the Act, and which will control the whole of the electricity transmission business of the country. The section reads:

> The Board and any local authority, company, or person, producing electricity by means of the utilization of water power, waste heat, or otherwise, may enter into arrangements for the purchase by the Board of any surplus electricity which the local authority, company, or person may be able to dispose of on such terms as may be agreed, and the Board may be authorized by order of the Electricity Commissioners to exercise such powers (including the power to break up roads, railways, and tramways) as may be necessary for the purposes of conveying the electricity so purchased.

WASTE HEAT.

You will note that the local authority, company, or person producing electricity need not be an electricity undertaking, statutory or otherwise, and that it enables any business or undertaking having surplus energy available to supply under agreement that surplus energy to the Central Board. I have in mind the enormous amount of waste heat that is being harnessed in large gas-works at present, for the power requirements of those works. Undoubtedly there is much surplus heat that cannot be absorbed by the works, and which, turned into a suitable form of power, can, and undoubtedly will, be supplied to the Central Board. I know cases where only a small amount of the surplus heat is utilized for gas-works power purposes; and great quantities could be recovered if there were a remunerative outlet for it. I think this section of the new Act has great possibilities for gas undertakings in this direction. There are people who say that a well-managed gas undertaking has no surplus heat. I know this is disputed by competent gas engineers; and it seems to me that, as gas-works must produce a certain amount of heat for making gas, which heat, after doing its proper work, has to be dissipated, the production of surplus heat cannot be avoided. I also cannot see that, however super-intelligent the management of a gas-works may be, it can carry out the operation of gas production and at the same time avoid having quantities of surplus heat in the form of a bye-product.

PURCHASE OF SURPLUS HEAT.

The object of the section is to enable the Central Board, in the endeavour to cheapen power supply throughout the country generally, to obtain from iron and steel works, coke oven plants, and any other undertaking producing it, waste heat that can be recovered and put to good use in the interests of the community. The gas undertaking deciding to recover its surplus heat does not require any Parliamentary authority, and the Board have all the necessary authority to buy it and make use of it, if and when it is available. But perhaps the principal reason why I consider there is greater possibility for co-operation between gas and electricity in the future than there has been in the past is the trend of electricity production on a large scale.

PULVERIZED FUEL.

In 1922 practically the universal method of producing electricity on a large scale was by means of large turbine generators, provided with steam by boilers fired by mechanical stokers using various grades of large or small coal. A most important development has taken place in the substitution of pulverized coal furnaces for lump coal furnaces during the last five years. So rapid has the progress been that the largest electric power station to be planned in the country has adopted pulverized fuel firing; and in other cases plants are already in actual operation. The coal (in some cases it cannot be called coal, as it contains up to 40 p.ct. of incombustible matter), is dried, pulverized to about the consistency of flour, and blown into boilers having large combustion chambers. Roughly speaking, the operation is similar to firing boilers with gas or oil fuel. The capital cost in a large station is not much, if any, greater than a mechanical stoker fired boiler house, and the efficiency is not much greater; but I think there is no doubt that cost will be reduced and efficiency improved. To my mind, the great advantage of a pulverized fuel equipment is the flexibility it provides in the choice of fuel. A large power station, having spent a great deal of money on mechanical stokers, is more or less tied to a limited range of fuels suitable for those stokers. In some cases it is very limited indeed; and if the price of that particular range of coal goes up, or it becomes scarce, it is practically impossible to alter the stoker equipment to make it burn another class of coal, except at a considerable expense—not only expense, but time, and the latter necessitates boilers being out of commission while the change is being made. Even were pulverized fuel equipments no cheaper than mechanical stokers, and no more efficient, the extreme flexibility in the choice of fuels that can be used is sufficient to warrant the pulverized fuel system being installed in preference to any other. The boiler house fitted with pulverized fuel apparatus requires practically no alteration to blow gas or oil through the same burners that convey the pulverized coal; and it causes no difficulty, either with pulverizers or any other part of the equipment, to change almost instantly from a very inferior high ash content coal to

the highest grade coal that can be obtained, or from a low-volatile to a high-volatile content.

There is every indication that the efficiency of pulverized fuel equipment is going to be superior to mechanical stoker equipment, and there are also indications that the cost of the complete boiler house is going to be lower than with other systems. For one thing, the use of pulverized fuel has already demanded a totally different design of boiler. One example is in operation in Manchester, and the Brighton Corporation have ordered two very large boilers of this new type. Not much is known yet as to the cost of maintenance of the new boiler, but the indications are that it will be eminently successful. If so, it must reduce the capital cost of the boiler house.

RAPID ADVANCE.

To illustrate the rapid advance pulverized fuel burning has made, it is only necessary to mention that one firm alone—International Combustion, Ltd.—have obtained the contract for doubling the large Barking Power Station, and building a new power station for the North Metropolitan Power Company. Only the other day they were awarded the contract, amounting to nearly a million-and-a-half pounds sterling, for the construction of the first section of the new Birmingham Corporation Power Station. These are only three out of many contracts secured by this Company for this system; and there must be other manufacturers who are getting a share of the work.

When one considers that five years ago there was practically not a single installation working on these lines, and that to-day one firm alone have in hand contracts for this equipment amounting to four-and-a-half million pounds, the advance made is almost staggering, because the contracts have been placed by people responsible for the continuous supply of electricity at the cheapest possible cost and on a very large scale. The point I am coming to, however, is not merely the use of pulverized fuel; but I had to describe this before taking you on the next step, in which, I believe, you will see a similar or even greater development than in the introduction of pulverized coal.

BYE-PRODUCT RECOVERY.

The restless spirits who have developed the use of pulverized coal so extensively and rapidly were not satisfied; and a year or two ago they developed processes for still further reducing the cost of steam-raising. This was bye-product recovery applied to the pulverized coal. No gas engineer needs to be reminded of the time and money spent in the past in schemes for the recovery of oil products from coal. I do not know whether it was an accident, or how it originated, but somebody found that pulverized coal, provided it had a sufficient volatile content, could be carbonized at low temperature at a comparatively rapid rate in tons per hour. Low throughput in tons per hour has been the bugbear of carbonizing coal at a low temperature. Unlike high-temperature carbonizing at gas-works, the temperature at which it was desired to bring off the oil products was so low that it took so much time to heat the coal that the capital cost of the equipment per ton-hour was excessive. I believe there is no question whatever that low-temperature carbonization, as a process, has proved satisfactory; that it does produce a useful smokeless fuel, and that it does produce oils of a peculiar nature which, were they available on a large scale, would greatly decrease the necessity for importing oil into the country.

Chemists have had plenty of opportunity of examining these oil products, and millions of money have been poured into the business in the endeavour to make it a commercial success. I do not know at the present time whether success has been proved or not. On the other hand, if the idea of producing a smokeless domestic fuel is abandoned, and the problem regarded as one of oil recovery only, and coal in a very finely divided state is subjected to carbonization at a low temperature, it is obvious that the throughput trouble is not likely to be as serious as before. At any rate, one of the largest electric power stations using pulverized coal recently fitted a bye-product recovery plant capable of dealing with 250 tons of coal dust per day; and I am informed that the results in gas and oil production are so satisfactory that a plant of similar size has now been arranged for in this country. Incidentally, it is found that burning pulverized coke in the combustion chamber of the boilers produces even more efficient results than burning pulverized coal, apart from the financial gain obtained from the sale of oil and gas.

CO-OPERATION BETWEEN GAS AND ELECTRICITY.

Now it seems to me that gas and electricity interests should get together here. In fact, they will have to come together; because if bye-product recovery is applied to these pulverized fuel plants—as it undoubtedly will be—the problem arises of dealing with the surplus gas produced. It can be burnt with the pulverized fuel in the boilers; but this I regard as wasteful, because low-temperature gas, even when stripped, has a high calorific value. The gas can also be converted to electrical energy by means of large gas engines on the lines of those being erected by the Staveley Coal and Iron Company, which process has been developed on the Continent to a great extent; but in my opinion—and in the opinion of many who are studying this subject—the proper way to dispose of the gas is to transmit it to gas undertakings for distribution to their consumers. Transmission of gas over long distances is now so general and so well understood that it does not present any particular difficulty.

I strongly urge all gas engineers, particularly the younger generation, to follow very carefully the development I have indicated—viz., low-temperature carbonization of pulverized coal. It can only be applied to large generating stations, on account of the capital cost; but as the Government have firmly set their faces against the construction of small generating stations, or even indefinitely continued use of small stations, the tendency to-day is all in the direction of the very large steam generating station. The oil products from the process will probably not interest gas engineers, as it is only the large gas-works that deal with these bye-products.

Though the progress in the combination of gas and electricity on the lines we discussed in 1922 is disappointing, the new development seems to offer great possibilities of co-operation, to the mutual advantage of the two industries. Only large power stations will be able to embark on bye-product recovery processes, and those smaller ones which continue to burn raw coal in a solid form will, I believe, not be allowed to exist indefinitely, or to be extended. In a few years we may reckon on seeing the concentration of electricity at a comparatively small number of very large stations.

I note the tendency in gas supply practice to shut-down small, inefficient, and isolated gas-works, and to connect them up to a larger works much on the lines of electricity supply practice. I have no information as to the financial results of doing this; but I think it must be beneficial to all concerned. We have gas undertakings supplying satisfactorily from one works several square miles of territory, and we have other cases where a gas undertaking supplies at (say) 5s. per 1000 c.ft., and a mile or less distant a little isolated works charges from 9s. to 12s. per 1000 c.ft. This surely indicates that there is a considerable scope for concentration in gas as well as in electricity production.

Discussion.

The CHAIRMAN observed that the lecturer had reviewed the developments which had taken place during the past five years. He had also made a prophecy regarding future advances. Mr. Broadbent said that any effort was to be commended which tended to foster co-operation or to bring about more economical use of coal.

HOPES DISAPPOINTED.

Mr. LEONARD LACEY (Senior Vice-President) said that it was obvious from the paper which had been read to them that evening that the hopes held out by Mr. Seabrook in his contribution to the proceedings of their Association five years ago had not been fulfilled. On the present occasion the author had pointed to two methods by which the relation between gas and electricity concerns could be maintained. The first was that the gas undertakings should sell to the Electricity Board electricity generated from the waste heat in the carbonizing process; and the second was that the gas undertakings should purchase from the super-stations, if low-temperature carbonization was carried out at these stations, the bye-product gas derived from this process. With regard to the first method, five years ago Mr. Seabrook had drawn attention to the fact that a large amount of surplus heat was lost in a gas-works. Part of this surplus heat was the sensible heat in the coke as it left the retorts; and he (Mr. Lacey) thought there had been little progress in the recovery of this heat. Another portion of the surplus heat lay in the sensible heat of the waste gases leaving the settings. Regarding this, steam-raising by waste-heat boilers would, he thought, soon be universal practice. The efficiency of the carbonizing process was being increased; and it might be that in the future the amount of surplus heat available would be less than formerly. Mr. Seabrook thought that there was sufficient surplus heat in a gas-works to generate electricity for outside supply; but to his (the speaker's) mind this was in the nature of a conjecture. There was a growing tendency to employ mechanical devices in the process of gas-making; and the power derived from the surplus heat was being utilized in connection with this mechanical equipment. The second part of Mr. Seabrook's paper was of outstanding importance. Could the author give them an idea of the quantity of gas available for sale if the electricity undertakings adopted the low-temperature carbonization of pulverized fuel? Also, he would be glad to know the quantity of this gas available in relation to the number of units of electricity generated, and whether it was necessary to re-pulverize the residual solid product. The author had enabled them to see that a connection still existed between gas and electricity undertakings; but the present outlook did not seem as bright as in 1922.

"CENOSPHERES."

Mr. G. PERCIVAL (Fuel Research Board) asked the author if he could tell them how much it cost to pulverize a ton of coal. Regarding low-temperature carbonization and the sticking of charges in the retort, this difficulty had now been overcome successfully by employing a semi-intermittent process of charging. A non-coking coal would produce, when carbonized at low temperatures, 18 to 20 gallons of oil, and about 5700 c.ft. of gas of a high calorific value. The resultant solid fuel could be used satisfactorily under boilers. As for the carbonization of pulverized fuel, Runge stated that his system completely overcame sticking difficulties, even at temperatures above 600° C. It was not necessary, said Mr. Percival, to re-pulverize the solid residue of the low-temperature carbonization of pulverized coal. This residue was in the form of small globules, termed "cenospheres," which were light, burned extremely efficiently, and could be carried to the furnace in a stream of air.

CONSERVING COAL RESOURCES.

Mr. W. T. KENSHOLE (Lea Bridge) expressed his disappointment at the Government's decision to regard unfavourably the supply

of electricity by gas undertakings. In the manufacture of gas, they could reach a carbonizing efficiency—including the heat in all the residuals—of between 70 and 80 p.ct.; and out of 100 heat units in the coal, they could supply to their consumers 45 heat units in the form of gas. On the other hand, the thermal efficiency of electricity generation varied between 8½ p.ct.—which could be taken as average practice—and 27 p.ct., a figure reached at the Crawford Avenue Station, Chicago. If, therefore, the Government were really concerned about fuel conservation, they appeared to be working in the wrong direction. What, asked Mr. Kenshole, was the efficiency of steam-raising by pulverized fuel? Recently he had read of a novel method of steam raising. He referred to the Benson boiler, in which critical conditions existed, and the steam had a temperature of 706° Fahr., and was at a pressure of 3000 lbs. per sq. in. By this boiler, it was hoped to raise the efficiency of electricity generation to between 30 and 35 p.ct. There was another point. Only about 10 p.ct. of the total gas output was used for power purposes via the gas engine. The efficiency of the modern gas engine was good; and the drop in this efficiency between full load and one-third load was not so great as formerly. This appeared to be another reason for his statement that the gas-works method of dealing with coal could at present be considered the ideal one.

UTILIZATION OF SURPLUS HEAT.

Mr. WALTER GROGONO (Gas Light and Coke Company), speaking about waste heat, asked whether this was more than sufficient for use on their own works. In an up-to-date gas-works having vertical retorts, the coke was discharged cold. Consequently no heat was lost in this respect. The waste gases from the setting were led, at a temperature between 700° and 800° Fahr. into tubular boilers; and on their exit the temperature was practically the same as that of the steam inside the boiler. Indeed, the necessary draught had to be induced by fans. All the steam produced could be utilized on their own works—for steaming the retorts, for generating electricity for works purposes, and for the exhausters. If, therefore, they were to condense the steam from the exhausts, they would have utilized all the heat possible. There would, in fact, be no "waste" heat. Moreover, if there happened to be a slight excess of steam, there were plenty of ways of utilizing it—for example, in the heating of lobbies, bathrooms, &c. He knew of no works which was run entirely on the steam generated from waste heat. All the works with which he was acquainted had additional steam-raising plant. Five years ago, said Mr. Grogono, they were under the impression that there was a great deal of waste heat in a gas-works. Since then they had altered their opinion. But there was another method of generating electricity from the product of gas-works—and that was by employing coke-fired boilers. This system, if more widely adopted, and if there was greater co-operation between gas and electricity concerns, would cheapen the cost of electricity. It was interesting to recall that Mr. Seabrook was one of the first in this country to use coke breeze for generating electricity. Mr. Grogono concluded his remarks by saying that greater attention should be paid to the sale of coke breeze. Coke would sell itself. Could breeze, he asked, be used as pulverized fuel?

PRODUCER GAS FIRED BOILERS.

Mr. J. H. GOLDSMITH (Hon. Secretary) observed that a certain gas undertaking supplying both gas and electricity had powers to supply a larger area with electricity than that with gas. In other words, one gas undertaking was creating electrical competition in the district of another gas concern, which certainly seemed peculiar. He was of opinion that electricity could best be produced by the gas undertakings. With the increasing use of gas and electricity for domestic purposes, as these fuels became cheaper, the employment of coke would gradually decrease, and gas undertakings would find large stocks of this fuel on their hands. This led him to suggest that it might be a good plan to place the hot coke from the retorts direct into producers, together with the breeze, and employ the producer gas for steam-raising—the steam being used for the generation of electricity. The question of the super-power stations recovering bye-products from the coal prior to its use for steam-raising was interesting. If electricity undertakings carried this out, they would in reality be copying in principle the gas-works process.

Mr. T. D. MCSWEENEY (South Metropolitan Gas Company) urged that gas undertakings should not supply electricity unless it was a paying proposition.

Mr. PERCIVAL asked whether anyone had tried the addition of up to 10 p.ct. of breeze to the coke used in the producers. He had found that the addition of a small quantity raised the efficiency of the producers.

Mr. M. WALKER (Lea Bridge) also contributed to the discussion.

THE AUTHOR'S REPLY.

Mr. SEABROOK, replying to the points raised, said that, in discussing with eminent gas engineers the question of surplus heat in gas-works, he had been assured that there was sufficient to supply other than works purposes. This opinion had been confirmed at Retford. In that town a waste-heat boiler had been installed, and the Engineer stated that it was capable of generating the power he required on his works, and of meeting the requirements of the lighting load of electricity. The latter meant 60 to 70 p.ct. of the running hours of the electricity station. Regarding the question as to the quantity of gas which would be available for sale by electricity undertakings which recovered bye-products, of course, with the low-volatile coal, containing anything between 20 and 40 p.ct. of incombustible matter, in general use to-day, it would not pay to recover bye-products. Anthracite duff was being used extensively in pulverized fuel units. Bearing this in mind, it could not be said that all the coal used would produce 5000 c.ft. of saleable gas per ton carbonized, which was the figure for a comparatively high volatile coal. As Mr. Percival had said, there was no need to re-pulverize the coke produced. Indeed, the latter was rather more efficient than the coal from which it was formed. No undertaking with pulverized fuel equipment in this country had been working sufficiently long to obtain accurate data respecting the cost of pulverization. A safe figure, however, was 2s. 6d. per ton, including repairs, labour, sinking fund, &c., charges. In America, higher grade coals were employed, and the cost of pulverizing was in the neighbourhood of 1s. 3d. per ton. Mr. Kenshole had asked about the efficiency of electricity generation by pulverized fuel. Without bye-product recovery, the heat required in the fuel was 10,000 B.Th.U. per kilowatt hour, which gave an efficiency of roughly 33 p.ct. Mr. Kenshole himself had mentioned a figure of 27 p.ct.; while twelve years ago 17 p.ct. was a very high efficiency. With the Benson boiler, the efficiency might be higher still; but the system had not yet been fully tested in practice. The week-in week-out efficiency of a boiler house fired by pulverized fuel was between 84 and 86 p.ct. Mr. Seabrook said that some electricity undertakings were equipped with plant for burning coke breeze. He wondered why gas concerns did not screen the breeze to smaller sizes. The expense of pulverizing coke was great.

Mr. KENSHOLE proposed, and Mr. E. C. NASH (South Metropolitan Gas Company) seconded, a vote of thanks to Mr. Seabrook, to which the author briefly replied.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes from Technical Publications.

By H. J. HAILSTONE.

GAS PURIFICATION.

The Raffloer process of dry gas purification is described by A. Thau in "Das Gas- und Wasserfach." In this process, dry oxide of iron powder is fed into the current of gas, and is transported to the top of the tower. In falling down through the stream of gas in the tower, it becomes sulphided, and thus extracts sulphuretted hydrogen; and the iron sulphide is extracted from the base of the tower for regeneration and re-use. By this means, it is stated, material may be worked up to a 70 p.ct. sulphur content, while the gas is completely freed from sulphuretted hydrogen. Such a process would appear to possess some of the main advantages of both liquid and dry purification methods; and its development will be of interest. Presumably a number of troublesome difficulties are likely to arise; but these should be by no means insurmountable, particularly as the pneumatic conveyance of oxides is now a well-established practice.

The presence of carbon dioxide in coal gas or water gas is mainly objectionable because of the lowering of resulting flame temperatures; and it is always desirable, of course, to limit the presence of this inert as far as is economically possible. With this in view, Fischer and Dilthey ("Brennstoff-Chemie") have conducted a series of experiments in which gas is washed in a tower with a stream of water, which selectively dissolves the carbon dioxide. The aqueous solution is then aerated, and the impurity thus driven off, so that the water may again be circulated. By such a process, the CO_2 content of a gas mixture was reduced from 22 p.ct. to 3 p.ct. It may be of interest to recall the work of Blair and other British investigators of this problem, reviewed in this column over three years ago (see "JOURNAL" for Aug. 1, 1923). They worked the system under pressure, and were able to reduce the carbon dioxide in a mixture from 60 p.ct. to 5 p.ct., using two towers.

While dealing with gas purification, a few words may be said on the estimation of sulphur in spent oxides. Those works chemists engaged on the soul-stirring occupation of determining this constituent in the presence of tarry matter will give silent thanks for the suggestion of Dr. Stavorinus, who has worked out the following method at the Rotterdam Gas-Works: The oxide is extracted with carbon bisulphide, and the solution filtered through activated charcoal, which retains any tarry and oily mattter. Pure sulphur remains in solution, and after evaporation of the solvent may be weighed. This should offer many advantages over the wearisome existing British standard method of treatment with strong sulphuric acid, &c.

NAPHTHALENE IN GAS.

In "Das Gas- und Wasserfach," Wissenberger recommends tetralin as an efficient wash oil for benzole extraction from coal gas, and particularly for naphthalene removal. An account of a works trial is given. For works use in this country, the cost of the washing medium makes the suggestion of little commercial interest; and doubtless the cost in Germany is still prohibitive for the purpose. It is, however, a

chemical which should rapidly decrease in price as the technique of its production becomes more advanced.

In determinations of naphthalene in coal gas, L. S. Walters has pointed out before the Sydney Section of the Society of Chemical Industry the errors introduced by the presence of indene. This liquid hydrocarbon, often present in appreciable amounts in coal tar and coal gas, is included in the Colman and Smith test along with the naphthalene; although it does not in any way contribute to service and main blockages, like its companion. The article is devoted to the description of a refined method of naphthalene estimation; and absorption in acetic and picric acids is advised, followed by treatment with bromine. The indene is removed, and pure naphthalene picrate obtained for determination in the usual manner.

The difficulty of estimating small amounts of naphthalene in oils was emphasized recently in the first paper before the Manchester Tar Conference. A reliable method is certainly called for as an aid in the control of naphthalene extraction plants where gas is treated with oil—a practice becoming more and more recognized as the most rational one for obviating blockages on the district due to naphthalene deposition.

Gas Analysis.

Fieldner and others have given, in a Technical Paper, full working particulars of the Orsatt apparatus approved by the United States Bureau of Mines. Though constructed on the principle of the Haldane apparatus, it possesses several slight modifications which should make for greater convenience and accuracy.

Recipes for cuprous chloride solutions for carbon monoxide absorption given by Moser and Hanika in "Zeitschrift für Analitische Chemie" show that a mixture of 55-60 p.ct. water, 24-27 p.ct. hydrochloric acid of "S.G.1.19," 16-18 p.ct. cuprous chloride, with 0·2 p.ct. stannous chloride, is very suitable for absorbing large amounts of carbon monoxide. Still better absorptions, however, are given in ammoniacal solution —*i.e.*, 74-76 p.ct. water, 13-14 p.ct. ammonia, and 11-12 p.ct. cuprous chloride—which mixture is capable of absorbing thirty times its own volume of carbon monoxide at room temperatures.

Naphthas.

Wood and others publish the results of their work on the effect of the various refining agents on sulphur compounds commonly occurring in naphthas. Sulphuric acid gives effective removal of thiophenes, sulphides, &c., but no reduction of carbon disulphide. Sodium plumbite and caustic, silica gel, alumina, &c., were also tried; and the adsorptive action of the two latter materials proved successful in removing similar compounds. In the same periodical ("Industrial and Engineering Chemistry"), a further paper gives particulars of the sodium hypochlorite treatment of naphthas. Here it is stated that the thiophene content remains unaffected, while the carbon bisulphide is partially removed. Wash liquors of high chlorine and alkali content give best results.

Prof. Nash, of Birmingham University, has given a comprehensive review of the present position of the manufacture of synthetic fuels from water gas by heat and catalytic treatment. This subject is one which assuredly will loom very largely in the future development of industrial organic chemistry and gas production. The manufacture of a carburetted water gas solely from the ingredients of blue water gas is an attractive theme; and although apparently not yet under cultivation in this country, it is being very energetically pursued in Germany, where the bulk of the research along such lines appears to be proceeding.

Ammonia and Sulphate of Ammonia.

The fascinating problem of the direct production of sulphate of ammonia from sulphuretted hydrogen and ammonia in coal gas continues, as it is bound to do, to give scope for earnest investigation and research; and an important contribution by Applebey and Lanyon has been made to the "Transactions" of the Chemical Society. The use of sulphuric acid, as such, is obviated; and oxidation with air, assisted by catalytic action, is employed to produce the sulphate. The range of catalysts studied included iron and other oxides in various forms. Using pure reacting gases, alumina gel and pumice appeared to be the best media; but in the presence of excesses of coal gas the efficiency of the conversion was very seriously affected, and there was considerable trouble owing to uncontrollable side reactions. It would have been of further interest to know to what extent the thermal value of the coal gas was affected during such reactions, as this factor is of prime importance in governing the economics of such processes.

Whitman and others have devoted attention to absorption problems, and in "Industrial and Engineering Chemistry" state the evidence obtained, which indicates that absorption of ammonia by water is most rapid when the washing liquid is introduced as a spray; and it appears from their conclusions that this form of gas treatment is superior to the "bubbling" or "scrubbing" methods so familiar to the industry.

With regard to the determination of ammonia in liquors, &c., several workers have stated their views. C. Jungblut uses the formaldehyde method, after first removing carbonates by treatment with caustic soda and barium chloride, and making neutral to methyl orange. The hexa-methylene-tetramine formed by addition of formaldehyde is removed, and the liberated acid titrated in the presence of phenol phthalein. Selke ("Chemiker Zeitung") uses the same principle in estimating ammonia in sulphate.

Quite another method is given by H. Atkinson in the "Analyst," by which the sulphate solution is treated with standard alcoholic potassium stearate solution and an excess of standard barium chloride solution. The excess of the latter reagent is back-titrated with more stearate, using "B.D.H. Universal Indicator."

Jander and Pfundt detail the electrometric method in "Zeitschrift für Angewandte Chemie." The use of a telephone, as in the simple conductometric test, is obviated, and replaced by galvanometer readings; and on addition of caustic soda, indications of free acidity and of ammonia are obtained. The possibility of the use of such methods has been previously indicated by me for saturator control; but much more experience is yet required before an adequate scheme can be elaborated.

Laboratory Methods.

Strache and Mika observe in "Das Gas- und Wasserfach," referring to crucible tests of coals, that the temperature inside the crucible is the most vital factor, and that instructions defining size of flame to be used and relative position of the crucible are insufficient to ensure reliable results. They therefore recommend working to a definite temperature (900° C. inside the crucible), as observed by pyrometer readings. The nature of the crucible does not materially affect the results, provided rapid initial heating takes place.

A further laboratory method for the preparation of absolute alcohol (Lyons and Smith in "Science") consists of the use of calcium carbide followed by a finishing treatment with anhydrous sulphate of copper. Almost theoretical yields are said to be obtainable.

The "Journal" of the Institute of Petroleum Technologists publishes Dr. Ormandy and E. Craven's recommendations for the estimation of free sulphur in benzole—viz., shaking the sample with a little mercury, and addition of hydrochloric acid. Filtration follows; and the precipitate is dissolved in aqua regia mixture. After neutralization with ammonia, a little HCl is added, and the sulphur determined as barium sulphate.

For comparatively estimating the various qualities and grades of lime, several methods adopted by Whitman and Davis are given in the "Journal of Industrial and Engineering Chemistry." In their study of the effect of steam and water, they conclude that the best grade of slaked lime is produced by agitating the lime with a large excess of boiling water. Use of steam or of small volumes of water results in excessive local temperatures, causing the formation of granular products.

In the study of drying problems, humidity ranks as a prime factor; and workers on sulphate caking problems will find a use for information given by E. Swan, who has shown that solutions of magnesium and calcium chlorides or glycerol may be employed to control humidity conditions in testing apparatus.

The use of foam-producing materials for extinguishing fires—particularly burning oils—has become well established; and the effectiveness of these compositions is largely determined by the permanence of the resulting foams under the conditions of use. H. E. Williams gives a detailed method by which such products may be comparatively examined ("Journal of Industrial and Engineering Chemistry"). The volume of foam derived from a given weight of composition is ascertained with standardized mixing and measuring vessels.

Heating Systems.

The "Transactions" of the Society of Chemical Industry have contained two papers of industrial importance. The first, by Major Tulloch, dealt with that fascinating aspect of gaseous heating—surface combustion. The theory and construction of the Cox diaphragm or "combustor" are clearly outlined, and records of savings of up to 60 p.ct. of gas consumption indicate the efficiency with which this perfected apparatus performs its duties. The further portion of the paper, dealing with some economic aspects of gaseous firing, should on no account be missed.

Quite fresh ground is covered by the second paper, in which J. A. Reavell describes the "Merrill" oil system of heat transmission. Curiosity is aroused as to the possibility of advantageously replacing steam heating by oil heating in certain operations where uniform temperatures between 300° and 600° Fahr. are required. The development and design of such systems present some interesting features of a chemical-engineering nature; and the numerous difficulties encountered are explained and followed by an excellent account of the manner of their solution.

Lubrication.

A paper like the one given by Dr. Dunstan and others before the Society of Chemical Industry Engineering Group should not be unnoticed by anyone interested in the principles of the fine art of lubrication. Much information is given regarding the fundamentals of the subject; and the fields for future investigation and progress are shown to be of considerable extent.

The work of Southcombe and Wells is given the important emphasis it merits; and methods for obtaining some indication of an oil's true "oiliness" are indicated. The "heat of wetting" method has been applied by Bachmann and Brieger to demonstrate the increased lubricating efficiency rendered possible by the judicious addition of graphite to oil.

SCREENS.

As the examination of coals, fireclays, chemicals, &c., frequently calls for sieve tests and mechanical grading, the use of standardized sieves would appear to be the first essential. In this connection, Ellington, and also Ogilvie, have pointed out at considerable length how great is the confusion that exists. A British standard is a long-outstanding requirement of workers engaged in the control of operations entailing the grading of materials. Though the problem has already been tackled in the States, it has not yet been settled here, except in a limited way. The main requirements are given in the "Transactions" of the Society of Chemical Industry, and the various terms defined. It is hoped that the matter will be further pursued, and required standards laid down so that standard sieves and wire screens, for both industrial and laboratory use, may become available.

CONCRETE.

The work of D. A. Abrams has been previously referred to in these notes (see "JOURNAL" for Dec. 26, 1923, and Aug. 26, 1925); and a new "Bulletin" from the Lewis Institute gives the tabulated information upon which formulæ for concrete mixings may be based. The all-important question of water ratio is emphasized, in order that dense and strong concretes may be assured.

That some work along the same lines has been done in this country also is made clear by the publication of a Technical Paper on the "Permeability of Concrete" by the Building Research Committee. This, too, lays great stress on the impotance of correct watering during mixing of concretes. The density of the resulting mass, its permeability, and its strength are all appreciably affected by deviations from the correct conditions of grading and mixing.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

Visit to the Auchengeich Coke Ovens.

A party of sixty members of the Western District of the Association inspected the new coke oven plant at Auchengeich Collieries, Chryston, on Saturday, Jan. 29.

Mr. JAS. K. DICKIE (Manager of the Coke Ovens), who received the visitors, explained that the plant was a modern one, and the first of its kind in Scotland. This was the only place in Scotland where the surplus gas was used to augment a town supply—that of Glasgow. There had been great changes since the juniors last visited Auchengeich. The old ovens were no longer in use, and the new battery was giving really good results. They were proud to act as pioneers of coke oven gas in Scotland.

Mr. JAS. GRAHAM (Vice-President) thanked Mr. Dickie and his assistants, and also Messrs. Nimmo & Co. for the privilege of again visiting Auchengeich. The juniors should be interested in such a plant ,which was so closely associated with gas-works practice.

Mr. J. MURRAY (Secretary) intimated that this was their Vice-President's last official duty with the Western District. Mr. Graham had recently been appointed Distribution Superintendent at Lancaster; and he asked him to accept the good wishes of all his junior friends for a very successful career in the South.

THE WORKS.

Some few years ago Messrs. Jas. Nimmo & Co., Ltd., decided to erect an addition to their coke-oven plant at Auchengeich; and after examination of the merits of the latest types of ovens, both in this country and abroad, the American Wilputte regenerative silica ovens were considered to be the most suitable to meet the Company's requirements. The Coppée Company (Great Britain), Ltd., own the patent of the oven for the British Empire; and they were duly entrusted with the construction of the new plant, to fit in with the already existing thirty Otto waste-heat ovens and bye-product plant. As it was known that there would be a surplus of coke oven gas, this was offered to, and accepted by, the Corporation of Glasgow for town supply. The Wilputte ovens were started-up in November, 1925; and gas was first supplied to Glasgow in December of the same year.

COAL HANDLING.

Run-of-mine coal (below 2 in.) is brought in private wagons to the tipping station. This is a reinforced concrete hopper below rail level, into which the coal is discharged, and from which it is elevated to a 400-ton concrete storage bunker through a Carr disintegrator. This latter is belt driven from an electric motor. The elevator is of the bucket and endless chain type, with supporting rollers.

CARBONIZING PLANT.

This comprises fourteen regenerative silica ovens in one battery, built between reinforced concrete end pinions. Each oven chamber measures about 32 ft. long, 11 ft. 8 in. high, and 14 in. in mean width. There is a taper of 2 in. from the ram to the discharge side of the oven. The plant has an approximate throughput of 70,000 tons per annum, and is capable of making 800 million c.ft. of coal gas, of which 60 p.ct. will be available for town supply.

The coking chambers and upper parts of the regenerators are constructed of 94 p.ct. silica material. The outstanding merit of the system is the simplicity of the heating arrangement. The oven side walls are divided into 24 vertical flues. In one-half of these flues the gas and preheated air are mixed and burned; the waste gases passing up the vertical flues, along the horizontal flue, and down the remainder of the vertical flues, through the regenerators to the chimney. Every half-hour the process is reversed; the air being forced by means of a steam-driven fan through the hot regenerators to meet the gas in the flues, and the waste gases heating-up the relatively cold regenerators on the other side. The temperature of the waste gases passing up the chimney is about 200° C. The volume of gas to each vertical flue is regulated by means of an accurately made fireclay nozzle. All the change-over operations are performed by one machine, which (1) cuts off gas, (2) reverses the air and waste-heat dampers, and (3) admits gas to the opposite side. The temperature in the flues is usually 1300°-1400° C.

There are several distinctive features about the carbonizing plant. The 14-in. oven is the narrowest in Great Britain, and, along with the high temperature, has made possible a record coking time of 14 hours for a charge of 8·5 tons of coal. The gas used for fuel purposes is 40 p.ct. of the total gas made. This is about the lowest fuel gas consumption possible, and means a consumption of 1020 B.Th.U. per pound of coal carbonized, or heat equivalent to 7·8 lbs. of coke per 100 lbs. of coal. These figures are based on a consumption of 860,000 c.ft. of 500 B.Th.U. gas per 24 hours. As a comparison with gas-works in Scotland, this relatively small unit is supplying a gas volume equivalent to the sixth largest gas undertaking.

The oven machinery is another distinctive feature of American coking practice, as the machines are more solidly built and work at higher speeds than the usual English machines, in order that the ovens may operate to a strict and fast time schedule.

COKE HANDLING PLANT.

At this battery hot coke is quenched away from the ovens in a separate enclosed brickwork station. On pushing, the charge is caught in the coke car, run quickly along to the quenching station, and there quenched with water from a system of overhead spraying pipes. The quenched coke is tipped on to the sloping coke bench, and allowed to cool for a few minutes before being conveyed to the screening plant by means of a rubber belt conveyor. The screening plant is erected over railway sidings, so that the coke can be loaded by gravity into wagons. Separated by a grizzly screen, all coke above 2 in. is passed into wagons for delivery to furnaces, &c.; and that below 2 in. is further separated by means of a shaker screen into nuts 2 in. to ½ in. and breeze ½ in. to zero.

GAS MAIN CIRCUIT AND BYE-PRODUCT PLANT.

The gas leaving the ovens passes up the ascension pipes to the collecting main, which is flushed with liquor. Leaving this main, it enters a 28-in. suction main, at the lower end of which is a toe piece with a dip leg into the pitch cistern. Here the flushing liquor and condenser tar are received, and overflow into an underground concrete well, where they separate; the liquor being again pumped to the collecting main, and the tar to storage tanks. The gas is next subjected to a specially designed liquor spray, at about 80 lbs. pressure, entering the stream. This causes the tar vesicles to coalesce and fall into steel collecting chambers. A static Pelouze and Audouin tar extractor is next in the gas circuit, from which the gas emerges practically free from tar and at a temperature of 70°-80° C.

The exhausters are three in number—two 110 H.P. De Laval turbines, driving through gearing five-stage Rateau type fans. The third is a direct driven 65 H.P. three-stage Bryan-Donkin machine. Hydraulic steam regulators are fitted to each. From the exhausters the gas, still containing its ammonia, is forced through one of two sulphate saturators, where the ammonia is absorbed. It is next passed through a series of three or four water-tube coolers, where it is cooled down to a temperature of 18°-20° C. Moisture and naphthalene are thus removed. Benzole is extracted by passing the gas into two tower scrubbers packed with 6-in. boards, down which a steady flow of creosote wash oil is maintained. More naphthalene is removed

from the gas at this point, and is recovered along with the crude benzole. The wash oil is then passed through the crude benzole still, and the debenzolized oil is passed back, after cooling, to the scrubbers for further absorption of benzole.

The gas, leaving the scrubbers at 18°-20° C., enters a distributing main which branches into two separate mains—one supplying fuel gas to the ovens through a governor at a predetermined pressure, and the other taking the surplus gas to the purification plant.

PURIFICATION.

The surplus gas main carries the gas to a Holmes rotary brush scrubber for naphthalene removal, and then to the five dry-lute purifiers. Four of these are worked in rotation by means of a Weck valve, and the fifth is used as a catch-box. The boxes are built of reinforced concrete 6 in. thick, with rubber-jointed steel covers and reversible inlet and outlet valves. They are fitted with steam coils; and there is a 3-ft. layer of oxide. Forward rotation and downward flow is the system adopted; and no great difficulty is experienced in maintaining the gas free from sulphuretted hydrogen.

METER, HOLDER, AND BOOSTERS.

Leaving the catch box, the gas is passed through a wet meter of 50,000 c.ft. per hour capacity. It then goes into a small holder of 10,000 c.ft. capacity, which acts principally as a governor between the meter and the boosters. From this holder it is withdrawn by one of two rotary boosters, and forced into the Corporation gas main against a pressure of 5 to 15 in. These machines are driven by horizontal steam engines, and are capable of delivering 1 million c.ft. of gas per day against 2½ lbs. delivery pressure. The final items in the main before it leaves the works are a stop valve and a balanced flap valve. The latter valve automatically closes the main should the gas supply from the ovens fail, and is normally held open by the pressure thrown by the boosters.

The following instruments are used for control throughout the plant. They are beneficial in effecting economies, and provide a definite check on the working throughout:

Wilputte Ovens.—Control room air and gas meters (volume meters); air, gas, and slack draught (pressure recorders); waste-heat temperature recorder.

Exhauster House.—Steam pressure recorder; Simmance-Abady indicating calorimeter.

Gas Plant.—Simmance-Abady recording calorimeter; Wright's "Dead-Beat" gas pressure recorder on the gas delivery main.

SUMMARY OF AVERAGE DAILY WORKING.

Number of ovens charged per day	22
Weight of coal per oven	8·5 tons
Gas per ton of coal	11,470 c.ft.
Calorific value of gas	500 B.Th.U.
Total gas per day	2,145,000 c.ft.
Fuel gas ,,	858,000 c.ft., or 40p.ct.
Surplus gas ,,	1,287,000 c.ft., or 60p.ct.
Coal throughput per annum	68,255 tons
Gas per annum	783 million c.ft.
Surplus gas per annum	470 million c.ft.

Fuel Data for Carbonizing.

B.Th.U. used per lb. coal carbonized	1020
Pounds of coke per 100 lbs. coal (gas-works practice)	7·8

HYGIENIC USES OF GAS.

A paper dealing with the hygienic uses of gas was read on Wednesday, Feb. 2, by Mr. E. ROWLAND WILLIS, of the Gas Light and Coke Company, at a meeting of the Institution of Sanitary Engineers, which was held in Caxton Hall, Westminster. In it, the author in the first place reviewed a few of the manifold hygienic advantages that accrue to every member of the community through the process of gas production. As a concrete example of the hygienic value of gas, he quoted the following: The sootfall in London in 1912 was 76,000 tons; in 1923-24 it was 35,000 tons. Gas cookers, gas fires, and other gas appliances in use in the Central London area had increased from about 750,000 in 1912 to somewhere about 1,500,000 in 1924. These figures revealed a decrease in sootfall of 41,000 tons, and an increase in the use of gas appliances of 100 p.ct. As a result of the smoke barrage sent up every hour by a myriad household chimneys, London loses over 40 p.ct. of the solar radiation from the beginning of November to the beginning of May; but, according to reliable statistics, the solar radiation in Westminster, which in 1881 was as low as 17½ p.ct., in 1920 had risen to 45 p.ct. Since then a further improvement has coincided with an increase in the use of gas appliances, the number of which in this district has trebled in the past four years.

VENTILATION.

After alluding to the value of the bye-products resulting from the operation of coal gas manufacture, Mr. Willis turned his attention to the benefits directly accruing from the use of gas. He showed how gas works-in with the conditions essential to a good system of ventilation—these conditions having been laid down by Dr. Leonard Hill as being: (1) Movement, coolness, and a proper degree of relative moisture in the air; and (2) reduction of the mass influence of pathogenic bacteria. Experience shows, the author said, that rooms illuminated by electric light become stuffy much more quickly, and there is a greater tendency to down-draughts than in those lit by incandescent gas. The late Prof. Vivian B. Lewes made some experiments in a room having a capacity of 2700 c.ft., and found that when the room was lighted by two Welsbach burners and mantles in a pendant, each consuming 4 c.ft. of gas per hour, the air at breathing level in the room was far purer and fresher than when three 16-candle incandescent electric lamps were used. Also, it was found that the result became more in favour of gas the larger the number of people in the room. A point that has been urged against gas—that is, the heat given off during combustion—is in reality the main factor in ventilating rooms so lit.

LIGHTING AND GLARE.

Regarding artificial light and eye fatigue, the best conditions, Mr. Willis remarked, are when the disposition of the light sources has been exploited to the greatest advantage—that is, when a point is arrived at which gives a minimum of glare; glare being due to the deep contrast of light and shade that is found to be such a strain upon the eye. Hence, what is required is a balance that will give conditions as near as possible to daylight. It is only natural that the higher the intrinsic brilliancy of the light source, the more difficult will be the problem of attaining sufficient diffusion to meet requirements; and even if this is achieved, is the maximum lighting efficiency being obtained from an economical point of view? Dr. Stockhausen states that the maximum degree of brilliancy that does not quite reach the point of fatiguing the eye is a little less than the light of the open sky in June or July. This is equivalent to the intensity of a source of light giving out about 4·35 candles per sq. in. Therefore we must see that the intensity of the source of light is as near this figure as possible. Anything brighter than this must be placed well up out of the usual field, or diffusing globes of opal or milk glass should be used. Perhaps the value of gas lighting from the point of view of glare can be better realized if a few comparisons of natural and artificial lighting agents, as given by Mr. Jacques Abady and Mr. A. P. Trotter, are quoted:

	Intrinsic Brilliancy in Candles per Sq. In.
Sunlight	600,000
Sky	2—5
Electric arc	1030
Electric glow lamp (Osram)	1000
E ctric glow lamp (Tantalum)	420
Inverted low-pressure gas mantle	20—25
Inverted high-pressure gas mantle	100—200
Candle	2·5

An examination of these figures gives quite sufficient indication of the reason why the use of unscreened metallic filaments is so frequently attended by eye fatigue.

The well-known excellence of the modern gas fire as a heating agent was emphasized, as was also the need for closer co-operation between those responsible for the construction of dwellings from the hygienic aspect and the gas undertakings. Atttention was then drawn to the fact that for cooking, from the hygienic point of view, and for convenience and efficiency, gas has no rival. Some people, the author said, imagine that the products of combustion become absorbed in the food when cooked in a gas oven. It is well known that meat during the process of cooking loses weight, proving that there is a constant emission of vapour. Therefore it can be justifiably assumed that no absorption is taking place at the same time; and experiments have been carried out confirming this assumption. In one case a herring, onions, and custard were cooked simultaneously in a gas oven; and no taste of the two foods first mentioned was perceptible in the custard.

FIRE RISKS.

The uses of gas for water heating were touched upon; and, among other matters, there was some information given in the paper regarding the relatively small fire risks of gas as compared with electricity. The Chief Officer of the Glasgow Fire

Brigade gave the following figures of fires caused by gas and electricity in his report for the year ending May 31, 1925:

—	Electricity.	Gas.
Dwelling houses	27	16
Outhouses, sheds, and cellars	2	1
Roofs, passages, and staircases	1	..
Shops	17	3
Churches, halls, and institutions	4	..
Works, workshops, and yards	6	3
Hotels, restaurants, and tea-rooms	2	1
Motor garages	1	..
Stores and warehouses	4	..
Tram-car	1	..
	65	24

The number of consumers of these fuels in that city were:

Gas	301,000
Electricity	61,639

A ratio of 5 to 1. Taking these figures in conjunction, it is found that the responsibility for fires is in the ratio of 13 to 1 in favour of gas.

In conclusion, the author expressed his thanks to Mr. Thomas Hardie for permission to read the paper, and to Mr. F. W. Goodenough for assistance rendered in its preparation.

POINTS FROM THE DISCUSSION.

The paper was followed by a discussion, mainly of a general character, which was opened by the President (Dr. G. S. Coleman), who emphasized the need for the control of domestic smoke. In the matter of ventilation, he thought the personal equation was too often overlooked. One person would experience a feeling of stuffiness, while another person in the same room might not. Stagnation of the air was the great thing they should aim at preventing. Mr. N. Hoskins, who proposed a vote of thanks to the author, declared that he could never work in a room heated by gas. Mr. A. J. Martin, seconding, congratulated their Past President, Mr. Edward Willis, on having a son who could produce such a paper. They were, he said, much indebted to the gas industry for the great contribution it was making towards the elimination of smoke. What was needed now was to rouse public opinion to the point at which the abolition of all avoidable smoke would be irresistibly demanded. In his own house he did not burn any coal whatever. He had a dozen or so gas fires; and no one in the house had at any moment been conscious, from the state of the air, that any gas was being used for heating the rooms—no trace of stuffiness or dryness due to the fires could be detected. Of course, he had had the best types of gas fires put in. Mr. Martin added that he specially desired to take this opportunity of publicly saying, with reference to the foremen and other employees the Gas Light and Coke Company sent out, that he had never come across a more courteous or a more obliging set of men. He appealed for closer co-operation between the designers and builders of houses and those who had to heat them. A lot of money might be saved by all-round recognition of the fact that the coal fire had had its day. A combination of gas fires, gas cooker, and coke boiler was an ideal one. Mr. M. B. Smith urged architects to give more attention to the construction of suitable flues for gas fires. In the course of his reply, Mr. Willis said that Mr. Hoskins' unfortunate experience must have been due to faulty design of the gas fire or of the flue.

"RAYFLEX" OPEN-FIRE COKE STOVES.

The new coke burning stoves introduced by the Carmuirs Iron Company, Ltd., of Falkirk, are of great interest, particularly as it is evident that an attempt has been made to develop an apparatus which will take advantage of the peculiar properties of coke without regard to the coal fire to which we have been accustomed. After all, there is little, inherent in the coal, which one would wish to imitate about a coal fire. The flame of a coal fire is certainly cheerful; but it is not very comforting, as anyone will admit on coming down to a freshly lit coal fire first thing in the morning. It is not, in fact, until a portion of the coal has turned into coke that there is much warmth. Heap on the coals, and wait until the whole is a glowing mass of coke, and it may be said with justice that the fire is at its most cheerful state. It would appear that the virtue of a coal fire lies in the coke which is formed during the burning of the fuel. If coke is treated as a fuel with regard to its own particular properties, something better than a coal fire should result.

ADVANTAGES.

In the ordinary coal fire the air for combustion passes through the ash-bed, then through the partially burnt fuel, and the products of combustion leave the fresh fuel which is placed on top of the fire. Dr. Geoffrey Weyman, the patentee, has adapted the down-draught system in the new stoves, more or less reversing the ordinary method. The air for combustion passes first through the newest fuel, then through the partially burnt fuel, and leaves by the ash-bed through the firebars, and up a flue box at the back of the stove to the chimney, as shown in the sectional illustration. This method of combustion possesses several advantages, not the least being that the surface of the fuel bed is entirely open and unobstructed and free to radiate heat.

It has been shown very clearly by Dr. Weyman that the zone of combustion naturally proceeds towards the point where the air is fresh, and where at the same time the fuel is fresh. This position is at the top of the fuel bed in the down-draught system, but does not occur in the ordinary method. It is true that, in the down-draught system, the gaseous products carry sensible heat downwards; but this is not nearly so large in amount as might be supposed, as the combustion of the air is complete and the volume of products is therefore small. By far the greatest portion of the heat developed from coke is radiated. It is for this reason that the top of this fire presents such a brilliant effect, and the freshly charged fuel so quickly reaches incandescence.

Another important advantage is that, if required, the full chimney draught can be made to pull directly on the fuel bed. In the ordinary fire, the canopy opening effectually neutralizes the chimney draught, as there is free vent above the fire into the chimney, and the fire depends for draught on the height between the fire and the canopy opening, and the natural uplift due to flame. But flame is virtually absent with coke as fuel, and the draught is too small to be relied upon. The "Rayflex" stoves are provided with a flue box at the back connecting the space below the inclined firebars with the chimney; and the canopy opening is restricted to a few small holes of a definite size, which provide for ventilation. As the chimney draught varies largely from house to house, but is almost always too large to be made to pull entirely on the fuel bed, the ventilator holes are provided as a means of adjustment.

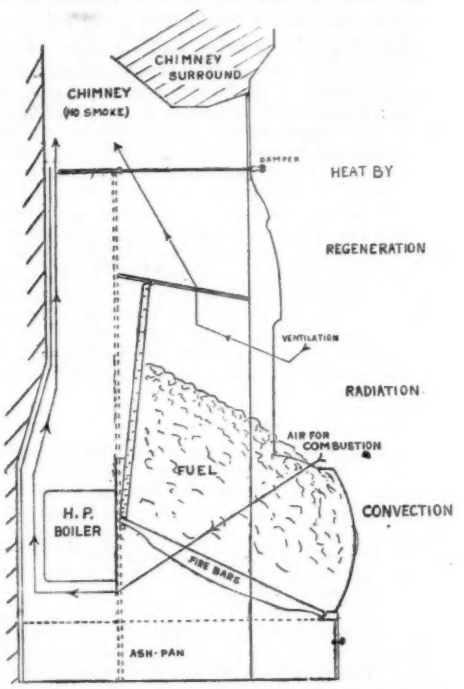


Fig. 1.—Rayflex Coke Fire, Section showing H.P. Boiler.

It will be noticed in fig. 2 that the small canopy behind which the ventilator holes are placed reaches low down almost on the fuel bed. The reason for this is that, unless the velocity of air passing through or near a coke fire is sufficiently high, there is diffusion of gases back into the room, which results in an objectionable smell. It is the function of the low-placed canopy and ventilator holes to prevent such diffusion when the damper regulating the down-draught is shut (in practice there is always a small clearance) and the grate is half full of ashes. Experience has revealed no trouble with sulphury odours.

LIGHTING.

The fact that ample and regulated draught is secured is a vital point, when it is considered how many varieties of coke there are upon the market, some of which are not so readily

combustible as others. The full draught which can be given at lighting times is no doubt responsible for the ease with which the fire is kindled. As the fire is down-draught, the method of lighting is nearly the reverse of the usual; and it is necessary to follow the makers' instructions carefully. The firebars are covered with a 2-in. layer of the coke. About a pound of sticks, some of which should be thin and easily kindled, are placed on the top. By throwing pieces of lighted paper on the sticks, these are ignited; and as soon as they are burning freely, the stove is filled with coke. In about twenty minutes the fire is throwing out an intense heat. The draught required to get such rapid kindling is naturally more than necessary for ordinary purposes; and the damper may be put in and not opened until the accumulation of ash begins to retard the draught.

The only trouble experienced with lighting the stove occurred in connection with a chimney which had a "back-draught," due to the "pull" of the fires in neighbouring rooms. In this case, the flame of the lighted paper was blown backwards into the room. The trouble was entirely got over by shutting the door and opening the window for a few minutes, until the sticks

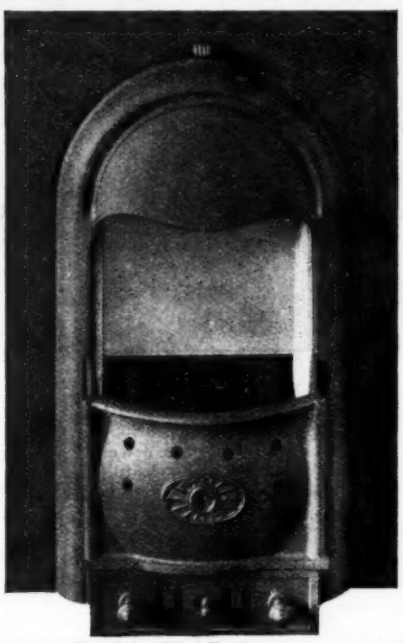


Fig. 2.—Rayflex Coke Fire, Type 2, 20 × 30 × 11 ins.

had caught, when a normal chimney draught was established. In justice, it must be said that the same thing happened with the original coal fire.

From the appearance of the stove it might be said that the radiant heat is directed at a somewhat high angle; but when sitting near the fire, it is a fact that the feet are quite warm. There is a good deal of convected heat from the stove front; but possibly an equally strong reason is the absence of air currents which normally sweep across the floor to an open fireplace.

As Dr. Fishenden has pointed out, the efficiency of any fire is nearly 100 p.ct., if the point of issue of the products of combustion is taken as being at the top of the domestic chimney, where in almost all cases the temperature is practically atmospheric. But the really useful work is that done in the room where the fire is situated; and the point of issue of the products is conveniently considered as being that of the canopy level. Owing to the enormous flow of cold air in addition to the products of combustion into the aperture of the ordinary canopy, the carbon dioxide content of the gases rarely reaches as high as 2 p.ct. The temperature is usually low, but very uncertain, depending on the state of the fire, and particularly on the presence of flame. With the down-draught stove, the temperature at the canopy level is probably on the average somewhat higher, but a good deal lower than might be expected, owing to the cooling effect of the metal work of the stove and flue box through which the gases pass before reaching the canopy. With the stove burning about 2 lbs. of coke per hour, a temperature of 350° C. was found at the canopy level, with a carbon dioxide content as high as 18 p.ct.—a remarkable figure for a domestic stove, and indicating that the air coming into contact with the fire is entirely used up. The products mix with air passing up through the ventilating holes beneath the canopy; but this volume is restricted, and is obviously much less than with an ordinary open canopy. The carbon dioxide content of the gases above this point was found to be 8 p.ct. in one case. This figure would be low, owing to leakage of air from around the stove. The loss due to carbon in the ashes appears to be about normal for coke, varying from 5 to 10 p.ct., according to the poking done and the character of the coke.

Comforting and Cheerful.

From the domestic point of view, the fire is certainly comforting, and cheerful to the point of brilliance; and there is no question about the rooms being adequately warmed. The coke consumption is at a maximum at the time of lighting, reaching as much as 6 or 8 lbs. per hour, but gradually falls, when the damper is put in and ash accumulates, to about 1 lb. per hour until the fire is poked. On a day's run of a fire placed in a sitting room, the total coke used was 24¼ lbs.; and during the thirteen hours the fire was used attention was given, either for poking or addition of coke, on eight occasions. These times were arranged to fit in with meal-times, which were at 8 a.m., 1 p.m., 5 p.m., and 7.30 p.m. The hearths with these stoves are easily kept clean, as the ash and dust is carried down into the closed-in ashpan, which can be carried away to empty, and the rooms are consequently less dusty than in the case of the usual coal fire. The amount of attention naturally depends

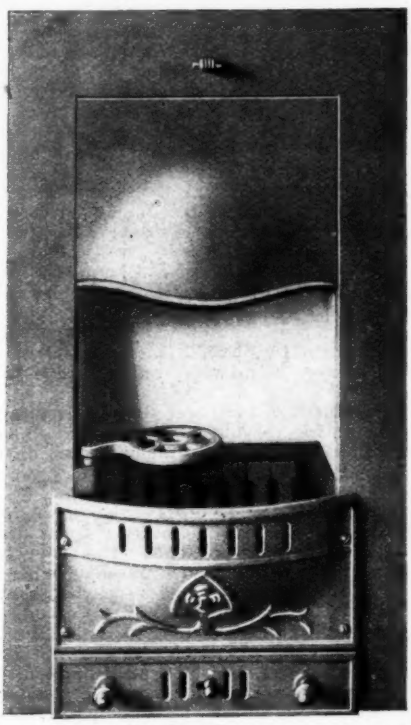


Fig. 3.—Rayflex Coke Fire, Type 3, 22 × 38 × 14 ins.

largely on the ash content of the coke. The stoves work best with coke graded from ½ in. to 2 in. diameter pieces.

The fitting-in of the stoves to an existing fireplace does not seem to provide any great difficulty, although some care should be taken to see that the draught is not too great. In cases of excessive draught, the ventilator holes can be increased in size or number, or, better still, a ventilator grating can be placed high up in the room wall. A grating is also provided in the ashpan, which is normally kept shut; but this may be opened if at any time the fire gets excessively hot. Provided that the fire is not allowed to reach a white heat, the firebars will last a considerable time, and are easily replaced, being loose.

The down-draught stoves should work well when fitted with a H.P. boiler at the back working in conjunction with a hot water circulator. This arrangement would appear to be a good one with modern houses, where a gas cooker is placed in the scullery and hot water is to be obtained from the sitting room fire.

It might be remarked that these fires form the most perfect "grill" or "toaster" imaginable.

Annual Tables of Constants and Numerical Data.*

We have recently received from the General Secretary of the International Committee instituted by the Seventh Congress of Applied Chemistry, Ch. Marie, 9, Rue de Bagneux, Paris, two volumes of Tables of Constants—one being "Numerical Data for Engineering and Metallurgy," extracted from Volume V.; the other, "Numerical Data for Electricity, Magnetism, and Electrochemistry," also extracted from Volume V. In both cases these are the data for the years 1917, 1918, 1919, 1920, 1921, 1922, and constitute, respectively, 240 and 135 pages of tabulated figures, the compilation of which must entail an enormous amount of work. Such data are not attractive to the ordinary scientific reader, but are indispensable to those engaged in research work in the subjects named. They are obtainable from the General Secretary.

* These tables are published under the patronage of the International Research Council and of the International Union of Pure and Applied Chemistry, by the International Committee instituted by the Seventh Congress of Applied Chemistry (London, June, 1909).

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Messrs. Crossley Brothers, Ltd., Openshaw, Manchester.

About sixty members of the Association were received at the works offices of Messrs. Crossley Brothers, Ltd., of Openshaw, by Mr. Walthew (Sales Manager), Mr. Bertsenshaw (District Manager), and Mr. Hensman (Works Manager), who, with Messrs. Brierley, Thomas, Decayne, and Needham, acted as guides through the extensive works. After inspecting the various workshops, and witnessing the testing of oil and gas engines, the party were entertained at tea in the staff dining room, at the invitation of the Directors of the firm.

DESCRIPTION OF WORKS.

The Openshaw Works are the headquarters of this well-known firm of gas and oil engine manufacturers, though it should be mentioned that the works comprise only one of four large factories where Crossley productions are manufactured. At the Openshaw Works, gas and oil engines are built ranging in size from 20 B.H.P. to 260 B.H.P., single and twin cylinder type. The visitors were interested in seeing the various processes and methods of construction from the pattern shops, foundries, and machine shops, to the final assembling and testing of the finished product.

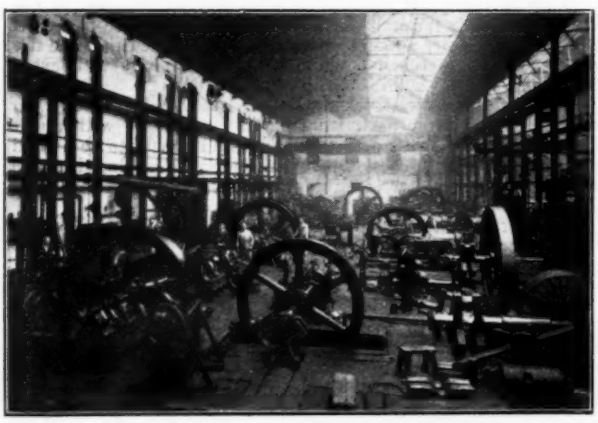
At the Sandiacre Factory, near Nottingham, Crossley-Premier gas and oil engines of the multi-cylinder type, both horizontal and vertical, are built in sizes ranging from 200 to 4000 B.H.P.

At the Erwood Park Works, near Stockport, which cover 48 acres of ground, horizontal four-stroke gas and oil engines, and also vertical two-stroke oil engines, are built in sizes from 4 to 20 B.H.P. Here also are built gas producer plants of the suction and pressure types, for all classes of solid fuels, and especially for dealing with wood refuse and other waste material.

Finally, at the Elstow Works, near Bedford, small horizontal gas and oil engines for agricultural use (2, 3 and 6 B.H.P., enclosed type) are built in quantity. Small electric lighting sets are made here. The firm also build oil tractors, locomotives, and road rollers.

Crossley Brothers were the pioneers of the gas engine in this country, when more than half a century ago the first efforts were made to solve the early problems. The changes and improvements since that time show how considerable has been the progress. From the slow-speed and somewhat cumbersome type of gas engine, the compact medium-speed engine of less weight has been evolved; and this modern engine is made from the highest grades of material, and with the very best workmanship. A perfected system of lubrication has contributed in no small degree to the success of the modern gas engine, which can safely be left unattended after starting-up, by reason of the automatic and continuous arrangements for oiling.

It has been pointed out that at present the demand for town gas engines is relatively small, due mainly to competition from the modern crude oil engine. The Crossley firm continue to fit all their gas engines, large and small, with variable admission governing gear, which embodies a movable fulcrum. With this system of governing applied to gas engines, exceptionally steady and quiet working is obtained.



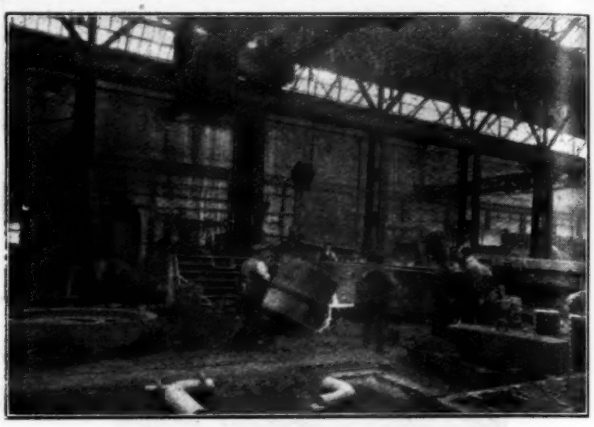
Testing.

Though a great deal of business is now being done in oil engines, Messrs. Crossley make a special feature of their convertible engine, whereby either crude oil or gas can be used. Many convertible engines are sent abroad; but so far as the home market is concerned, the demand appears to be limited.

With regard to the future, it would seem that, if the gas undertakings are to see a revival of the town gas engine business in this country, it will be necessary to cheapen the cost of town gas to power consumers. At 1s. 6d. per 1000 c.ft., for example, it appears certain that the medium size town gas engine would again come into its own, because of the greater convenience and reduced capital outlay compared with the oil engine. As regards the small gas engine trade, with gas at about 2s. per 1000 c.ft. there would very probably be a considerable revival of business. It is well worth while, therefore, for the gas undertakings throughout the country to give this matter their careful consideration.

VOTE OF THANKS.

Mr. BATTERSBY (President) called upon Mr. TEASDALE (Salford) to move a vote of thanks to the Directors of the firm. Mr. Teasdale said that the members were much indebted to their guides. All the members came fully expecting to see good workshops, good workmanship, and a well-organized group of shops; and their expectations had been fulfilled.



Casting.

Mr. MASSEY (Oldham) seconded the vote; and Mr. WALTHEW replied.

The following paper was then read:

LUBRICATION.

By F. N. BOOTH, of Rochdale.

[Extract.]

Lubrication is an important factor with regard to the efficient and economical working of all mechanical appliances, whether we consider the simple case of a gasholder guide roller pin or the complicated one of the most modern engine.

The causes of friction have been assigned to:

(1) Inequalities in the surfaces in contact.
(2) Cohesion due to pressure.
(3) Attraction between two masses.
(4) Magnetic or electrical force.
(5) Internal motion of the particles in the medium used as the lubricant.

Friction is responsible for:

(*a*) Wear.
(*b*) Loss of power.
(*c*) Generation of heat.

LUBRICANT.

A lubricant is an unctuous body which readily forms a continuous coherent and durable film capable of holding apart the surfaces in relative motion, and itself setting-up the least possible resistance. It has the effect of substituting for the solid surface friction between the metals in contact, the internal friction of a fluid, which, under the same conditions of load, speed, and temperature, is less than the friction between solids.

Friction itself is divided into three classes: Dry, greasy, and viscous. The three stages of lubrication to which these correspond are: Unlubricated, partially lubricated, and completely lubricated surfaces. The approximate values of the coefficients of friction obtaining in these three stages are: 0·1 to 0·4, 0·01 to 0·1, and 0·001 to 0·01. Our knowledge of these three stages is at present incomplete. If it were perfected, great improvements in the durability of friction surfaces and in the quality of lubricating oils generally might be expected.

With reference to the loss of power due to friction, it has been estimated that an average bearing absorbs 0·1 H.P.

Perhaps the most important effect of friction is wear; and 2½ p.ct. of the value of mechanical plant has been put down as a fair average allowance per annum.

PROPERTIES OF A LUBRICANT.

A good lubricant should possess the following qualities:

(1) Sufficient body to keep the surfaces free from contact under maximum pressure.
(2) The greatest possible fluidity consistent with the above.

MACHINE SHOP AT THE OPENSHAW WORKS.

(3) The lowest possible coefficient of friction.
(4) The greatest capacity for storing and carrying away heat.
(5) A high temperature of decomposition.
(6) The capacity to resist oxidation.
(7) Freedom from any corrosive action on the metals upon which it is used.
(8) Freedom from tendency to gum.
(9) Durability.

The ordinary methods of testing lubricating oils include determinations of viscosity, specific gravity, and flash and fire temperatures. Another important property of lubricating oil is its "oiliness" or "greasiness;" and this property is not so readily determined by analysis, and there seems to be no accurate method for its determination. It is readily distinguishable to the touch, and is an important property concerning the efficiency of all lubricating oils.

Viscosity.—In choosing an oil with respect to its viscosity, it is necessary to bear in mind the fact that the oil should only be thick enough to form a complete film over the bearing surface. If thicker than this, it will only tend to retard motion, due to its own thickness. Since the viscosity of an oil decreases with increases in temperature, it is advisable to make the test for this property at the temperature at which it will be when in use. Generally speaking, the less the viscosity falls for increase of temperature, the better the oil is considered. Oils showing the same viscosity are not necessarily of equal value as regards their lubricating qualities.

Specific Gravity.—With regard to the lubricating value of an oil, its specific gravity is of little importance, though, as a rule, the lower the specific gravity for oils of the same viscosity, the better.

Flash Points.—The greater the difference in temperature between the "open" and "closed" flash points, the better is the quality of the oil as regards its degree of refining.

Fire Point.—This, too, indicates the degree of refining.

Acidity.—Lubricating oils should be free from acidity, as this is detrimental to the metals on which the oil is working, causing corrosion. Acidity may be inherent in the oil, or may develop during use, due to the presence of steam, moisture, or the action of the atmosphere. A piece of tool steel suspended in the oil should keep bright, and show no signs of corrosion.

Oxidation.—The resistance of an oil to oxidation is of great importance, particularly where the oil is exposed to high temperatures. Oxidation is accompanied by gumming and the formation of sludge and acid.

Demulsibility.—The tendency of an oil to form an emulsion

THE ERECTING SHOP.

with water is important in cases where it comes in contact with wet steam. A test for this property can be made by shaking up equal quantities of oil and warm water in a bottle, and leaving the mixture to stand for 24 hours, when the amount of emulsion formed is noted.

Types of Lubricant.

Lubricants can be divided into two main classes:

(1) Fixed oils and fats.
(2) Mineral oils, greases, and solid lubricants.

The former are from animal and vegetable sources, and consist usually of what are known as glycerides, of which stearin, palmitin, and olein are the best known. They are usually excellent lubricants, but tend to gumming. Fixed oils have a greater surface tension than mineral oils, which allows of their being reduced to a thinner film without being ruptured.

Mineral oils and greases consist generally of a more or less complex mixture of hydrocarbons which do not contain oxygen. They do not corrode, but are generally regarded as inferior lubricants compared with the fixed oils. They are affected by heat to a much greater extent than fatty oils, and rapidly lose viscosity with increase of temperature. They do not oxidize or develop acid due to the presence of steam or moisture or the action of the atmosphere. Most mineral oils can be improved by the addition of a small quantity of fatty oils.

The conclusion drawn from some tests recently carried out by the Lubricants and Lubrication Inquiry Committee using a Lanchester worm gear machine is that "the addition of rape oil to a mineral oil raises the temperature at which a possibly serious falling-off in lubricating value of the latter begins to occur. A 2½ p.ct. mixture of rape oil is sufficient to produce this effect."

It has been suggested that the fatty oil exerts a softening influence on the mineral oil, and may even be said to grease the molecules of the mineral oil, and reduce their internal friction.

In addition to oils and greases, solid lubricants are used for certain purposes. These are of mineral origin; and the most common are graphite, mica, talc, and flowers of sulphur. Solid lubricants are usually less efficient than liquid lubricants, but are sometimes more easy of application. The action of solid lubricants is to fill up the irregularities of the surfaces in contact, and to act as a smoothing agent. Slow-speed bearings under low pressure and in inaccessible places may be lubricated in this manner. Graphite may be mixed with lubricating oils in some cases with beneficial results. The immediate effect is to increase the frictional resistance; but after working for some time, the irregularities in the surfaces are filled up by the graphite, and the coefficient of friction is reduced. Where a bearing has been left standing for some time, it often happens that the oil has been squeezed out by the load on the bearing. On starting up a machine with the bearings in this condition, there is a liability for them to seize. If, however, the surfaces have been coated with a veneer of solid lubricant, this risk is minimized, as actual metallic contact between the surfaces is prevented.

Suet, tallow, and grease, can only be regarded as lubricants in that they may be more or less readily converted into oil. They offer the advantage that they act as a store of lubricating material; but since they require a certain amount of heat to liquify them, they may be said to defeat their own object to a certain extent.

Automatic Oiling.

Under this heading may be classed ring-oiling, wick feed, bath oiling, and drip feed methods. Ring oiling is adopted chiefly for shaft bearings. For it to be successful, the shaft must rotate at sufficient speed to keep the ring in motion; otherwise it will not function. The wick feed has its uses; and the oil bath is particularly suitable for driving chains. By the drip feed method, the oil is allowed to flow from a glass or metal container, through an adjustable needle valve, on to the bearing surface to be lubricated. This system is a big improvement on the hand-oiling system, as the supply of lubricant is continuous, provided the container is kept charged, and the oil passage free from obstruction in the form of grit or dirt.

One particular type has one disadvantage. I refer to the type in which the oil, after leaving the container and passing through the needle valve, is allowed to fall into a hole in the casting of the machinery. It often happens that this hole gets choked with dirt, and the oil, instead of passing through it, gathers on the metal round the hole, and flows away by the easiest path. In a dark place this may not be noticed for some time. I have seen a gas engine the cylinder of which was lubricated—or supposed to be lubricated—in this manner, when the oil was flowing down the fillets connecting the cylinder to the bed plate, and none at all was getting to the required place. It would seem to be a better idea to have the oil carried from the container direct by a pipe into the casting, so minimizing the risk of the hole becoming choked.

A point worthy of note, and one which is common to all lubricators of this type, is that, as the oil level falls in the container, the rate of feed becomes slower. Thus, when filled, the lubricator should be adjusted to feed slightly in excess of what is required.

Forced feed entirely eliminates the human element, and, if the lubricator is properly designed, ensures the correct amount of oil being supplied at the right time and place. Lubricators of this type are operated through suitable gear from some reciprocating member of the machine; and oil is pumped on to the bearing surfaces by small plunger pumps. This system has the advantage that it only operates while the machine is working. Moreover, the feeds of oil to the different parts of the machine can be grouped together at the most convenient place for regulation and inspection.

Economy.

With regard to economy, a considerable amount of oil, after use, can be filtered and employed again. This operation can be carried out several times with the same oil, until its nature becomes exhausted. Discretion must be used as to what purpose it is put to after its initial usage. Naturally, cylinder oil would not be employed for the same purpose twice; but it could be filtered, and used afterwards on subsidiary bearings.

Many firms now make it a practice to have the lubrication of their machinery carried out by people specializing in this business. It is usually done at contract rate, and the contractors supply the lubricant, lubricators, and filters, together with advice and periodical inspection. As regards gas-works, the price paid for this service is usually based on the quantity of gas sold per annum.

Steam Cylinder Lubrication.

The most common method of applying the lubricant to the steam cylinders of an engine is through either the cylinder walls or the steam chest. By this method, it is doubtful whether the oil is distributed entirely over the surfaces of the cylinder and valves; a considerable amount being no doubt swept forward to the exhaust, without performing its proper work. A better method is to introduce the oil into the steam pipe through an atomizer near the steam chest. The atomizer should project into the centre of the steam pipe, so that the oil comes in contact with the steam where its velocity is greatest. The oil is then broken up into minute particles, and is intimately mixed with the steam, and carried to all parts of the cylinder and valves.

Gas Engines.

Gas engines are particularly dependent on lubrication for their efficiency. The oil best suited for the lubrication of the cylinder is a high-class mineral oil. The high temperatures in the cylinder, together with the high linear velocity of the piston, render the use of vegetable oils unsuitable, though a small quantity may be mixed with the mineral oil to give it more body. Castor oil is most suitable, on account of its non-liability to form gummy deposits when subjected to heat. The oil should not be too viscous, or it will not readily spread over the surfaces of the piston and cylinder, and will thus cause excessive wear. On the other hand, it should not be too light; otherwise the film will break-down under the influence of the high temperature, with a similar result.

The cylinder, piston rod, and crankshaft bearings should always be lubricated with fresh oil, while the subsidiary parts may be lubricated with oil which has been previously used and filtered.

The method adopted by Messrs. Crossley Bros. for the lubrication of the piston pin of their engines is worthy of note. The oil is delivered from a force-feed lubricator to a small circular washer free to rotate in a slot in the oil pipe at the crank end of the cylinder. A boat-shaped piece of metal fixed to the piston just touches the washer for a fraction of a second during its stroke, and wipes off the suspended globule of oil. This then flows down a pipe and through the piston rod boss on to the piston pin. The regulation of the flow of oil to the washer has to be carefully adjusted, and the globule must not be too large, otherwise it would be blown off the washer by the rush of air before the piston could reach it.

Over-oiling of an internal combustion engine should be guarded against, for, if an excessive amount of oil is used, it will get on to the back of the piston and be burnt to a scale or crust, and will form deposits on the valves and plugs. The usual quantity allowed is one drop per minute for each inch of diameter of the piston. No engine should be put on load until it has been ascertained that all the working parts are properly lubricated and that all the lubricators are functioning.

Exhausters.

Exhausters require special attention as regards lubrication. Their relative positions with respect to the condensers and tar extractors is an important item bearing on this point. If the exhausters are placed prior to the condensers, no lubricating oil is required except for the pin and block, or pin and hinges, as the case may be. These parts of the machine should be lubricated with a good machine oil, which should be a mineral rather than a vegetable oil, which latter would tend to thicken with tar. The oilways should be kept clear by having a little creosote flushed through them periodically, if there is any tendency for them to become stopped-up with tar. The tar present in the gas is sufficiently oily to lubricate the recesses in the end plates for the inner drum. It is important, however, that the fluidity of the tar should be maintained; and to ensure this, the lubricators to the races should be supplied with creosote oil. This is not a lubricant itself, but, by keeping the tar in solution,

it assists it to retain its lubricating properties. If the exhausters follow the condensers and tar extractors, and there is little or no tar coming over with the gas, or if the tar is very thin, a good machine oil should be used to lubricate the races for the inner drum.

Discussion.

Mr. TEASDALE remarked that lubrication on a gas-works did not always receive the attention it should.

Mr. SINGLETON (Stockport) spoke about the necessity for testing all oils received at the works.

Mr. HAILSTONE (Rochdale) said that in his works all the oils were tested and tabulated without any regard to the price. This was filled in after the test had been made. Mentioning the wide variations in the price of oils, he thought that there was lack of reliable information that the engineer and chemist could get at, so as to determine the true value for certain uses.

Mr. HANDLEY (Denton) remarked on the number of oils required on even a small works. What was the best form of lubricant for the extractor gear of vertical retorts?

Mr. BATTERSBY said that graphite grease was most suitable.

Mr. CARTER (Liverpool) also took part in the discussion.

Mr. BOOTH (Ramsbottom) moved, and Mr. KAY (Bury) seconded, a vote of thanks to the author, to which Mr. F. N. BOOTH replied.

COMPLETE GASIFICATION.

THE POSSIBILITIES OF AN OXYGEN PROCESS.

[From "Das Gas- und Wasserfach," Nov. 20, 1926.]

In this number, our contemporary published the complete text of a paper read at the annual meeting last June of the German Gas Association, by Prof. Dr. R. DRAWE, of Charlottenburg. The full title which he gave to his paper might be rendered as "The utilization of coal to the best advantage by converting it into high-calorific gas and liquid fuel." He confessed to a certain hesitation in discussing details of a suggested process without as yet having had the opportunity of carrying out even elementary tests upon it. His justification was that the technical side could, as they would see, be nothing but straightforward. It was only the economic side which was in question.

All natural solid fuels can, by heat, be broken up into three parts—solid, liquid, and gaseous. This dissociation the author describes as "coal improvement," by which he means the employment of it in some better way than by direct combustion, or the winning from it of products which in the aggregate are more valuable than the raw material. As compared with gaseous and liquid products, the solid product, coke or semi-coke, has always the disadvantage of its ash contents, the solid remnant which has somehow to be disposed of ultimately. The question arises, therefore, whether a practicable process cannot be evolved which produces no solid fuel, but converts the whole value of the coal into high calorific gas and liquid fuel.

According to what the ultimate object of the coal treatment may be, one of the products, either liquid or gaseous, must be regarded as the staple one, and the other as a bye-product. The Bergius process is cited as an example of such treatment of coal, whereby liquid fuel is produced in the first place, with gas as bye-product; and, however much the economics of the system may be in question, the technical achievement is great. If fault must be found, it is that the ash, which is usually regarded as an unpleasant characteristic of solid fuel, is, in this case, transferred to the liquid product. But Prof. Drawe is confident that, with time, experience, and necessary expenditure, this difficulty will certainly be overcome. The converse to the Bergius process is the production primarily of high-value gas, with liquid fuel as bye-product. By high-value gas, the author understands a gas with which combustion temperatures can be obtained equal to those given by other fuels, such, for instance, as oil, and, above all, pulverized coal. The second form of treatment has also been successfully exploited, notably, of course, in the water gas process, and in so-called "complete" gasification. The gases so produced satisfy all the requirements of practical industry; but processes of this kind seem all to have the basic deficiency of non-continuous working. The one continuous process of the kind—that which produces gas by the gasification of solid fuel with an air-water vapour mixture—suffers from the lowering effect upon the gas of the nitrogen contained in the air. It cannot produce the required temperatures when employed in the cold purified state without considerable expenditure on pre-heating the combustion air, and sometimes even the gas itself. In the whole realm of coal treatment, however, gasification, whether by an intermittent or a continuous process, is the only known method of separating the combustible from the ash in the solid fuel.

Since, in the continuous process, it is the nitrogen of the air which depresses the calorific value of the gas won, the question at once arises of eliminating it from the process. In the place of air, the course which suggests itself is gasification with technically pure oxygen, with such admixture of steam as will permit of control being exercised over the combustion process in the generator. This method is no new suggestion; but attempts to introduce it have hitherto failed, in most instances from the point of view of payability. Naturally, the important factors in the latter connection are the form of plant required, the choice of fuel, and the products won. The author's endeavour is to give specific facts and figures, and to show that it is a practicable proposition, using a type of plant already tested for gasification with air.

ELIMINATING NITROGEN.

Oxygen is admittedly expensive, so consumption must be kept as low as is compatible with the production of a high-calorific gas. It is quite clear that the process itself is considerably simplified by the substitution of an oxygen-steam mixture for air-steam. In the first place, no nitrogen is present, and it is nitrogen which obstructs the desired reactions, and which causes a relatively quicker permeation of the fuel in the generator by the air-steam mixture, thus undesirably curtailing the reaction period. Eliminating the nitrogen, there will be required only 1·1 cub.m. of oxygen-steam per kilogram of fuel [17·6 c.ft. per lb.], instead of 2·3 cub.m. [36·8 c.ft. per lb.] in the case of air-steam. Corresponding to the higher calorific value, the volume of gas produced is also smaller. The throughput per unit of apparatus is, therefore, increased with corresponding reduction in capital cost. It should be noted, however, that the author has purposely not taken this favourable factor into account in his subsequent calculations. In the choice of fuel to be treated, it must be remembered that the function of the oxygen is the gasification of the solid carbon. Therefore, to minimize oxygen consumption, a high-volatile bituminous coal is to be preferred to one of high fixed carbon.

The actual process can be achieved in various ways—as, for instance, by a combination of generator and low-temperature distillation column of known design. The coal is subjected to distillation in the latter by the heat of the gases emanating from the gasification column; the semi-coke thus produced proceeding downwards into the generator for treatment with the oxygen-steam mixture. Here, only high-grade gas would be produced, and its quantity would be so small compared with that from the air-steam method, that it would actually just about suffice for the distillation process. Thus only one gas outlet and tar-extracting plant would be required.

ECONOMICS OF THE PROCESS.

In order to give as fair an idea as possible of the economics of the process, the author avoids, in his estimates, any favourable assumptions—as, for example, the availability of a cheap, low-grade coal, though he considers this process would be more suitable than any other for dealing with such a coal. He therefore selects a coal of about 12,800 B.Th.U. net calorific value, with 27 p.ct. volatiles and 60 p.ct. fixed carbon. For the gasification of the carbon there are required, per pound of coal, 7·21 c.ft. of oxygen and about ½ lb. of steam. From 1 lb. of coal there are thus produced 28·84 c.ft. of gas, which is a mixture of the clear gas produced in the generator and the crude gas from the low-temperature distillation column. The calorific value might be estimated at 360 B.Th.U. net, and 380 B.Th.U. gross. Thus, the gas produced is four times the quantity of the oxygen used.

The clearest view of the economics of the system may be obtained by taking an example; and the author has ascertained in some detail the capital and working costs for a plant of 100 metric tons per day. [The metric ton on which his calculations are based is 0·9842 of the English ton.] Such a plant would deliver 180,000 cub.m. [6,357,000 c.ft.] per day. The cost of it, with washing and purification apparatus, but without provision for working-up benzole and ammonia, would be 800,000 RM., or £40,000, taking the reichsmark at 20 to the pound sterling [actually it is about 20·43]. Plant to produce the requisite oxygen is estimated to cost about 700,000 RM., or £35,000, and electrical plant to work it, if power is not available otherwise, another 500,000 RM., or £25,000. The total capital cost for 100 tons a day would therefore be in the neighbourhood of £100,000.

In the following calculation, the author has taken the installation as running for 350 days at full capacity.

Running Costs of the Oxygen Plant.

1. Depreciation and amortization at 20 p.ct. of 700,000 RM.	RM. 140,000
2. Labour, upkeep, and chemicals, &c., at 1 pf. per cub.m. oxygen 350 × 45,000 × 0·01	155,000
3. Power at 3 pf per German H.P.-hour [about 0·35d. per English H.P.-hour]	340,000
	RM. 635,000

which makes the cost of oxygen about 0·04 RM. per cub.m., or 1s. 1d. per 1000 c.ft.

One ton of coal yields 1800 cub.m. of gas, therefore the total make for the year is 100 × 1800 × 350 = 63,200,000 cub.m. [2232 million c.ft.]

Cost of Producing 1000 Cub.M. of Gas.

1. Coal 1/1·8 = 0·55 ton at 22 RM.	RM. 12·20
2. Oxygen 1000 × 0·245 × 0·04 RM.	9·80
3. Steam (0·5 ton per ton of coal) 0·55 × 0·5 = 0·275 ton at 2·5 RM.	0·75
4. Depreciation and amortization at 20 p.ct.	2·55
5. Labour	1·20
6. Maintenance	1·00
7. Water and power	2·00
8. Administration	0·50
	RM. 30·00

Therefore 1000 cub.m. would cost RM. 30
1000 calories " " RM. 0·009 calculated on gross calorific value
1000 c.ft. " " 10d.
1 therm " " 2·6d. calculated on gross calorific value

The author claims that this estimate is very moderately compiled. He has taken no credit for the value of the tar recoverable, which would be about 2 RM. per 1000 cub.m. of gas. In spite of this, production costs are low, reckoned upon the calorific value. In many instances it might be considerably lower. Cheaper high-ash coal could be used, and the oxygen might be produced much more cheaply if power could be purchased in bulk. This should often be possible, as the oxygen plant would run 24 hours daily on a constant load. In addition, he has taken no account, either in capital or working costs, of the greater throughput per unit of plant which would be possible when using oxygen instead of air. There is also the considerable quantity of nitrogen which is made in the process of recovering oxygen from the air. If this could be put to any use, the cost of oxygen would be still further reduced; and the author ventures the suggestion that ammonia might be made, the hydrogen required for its synthesis being obtained from surplus coke.

Prof. Drawe sees the principal advantage of the new process in its continuity, which permits of much better supervision and more economic working than with an intermittent process. Its best chance is where cheap power is available, and also a supply of lumpy bituminous coal, of low grade, and consequently cheap. Even without these special conditions, however, payable results should be obtainable, especially if the incidental nitrogen recovery can be turned to account. He is convinced that it is only a question of time before the conversion of solid fuel into high-grade gas with the help of oxygen will be commonly adopted; and he expresses the hope that his fellow-countrymen will be the first in this new field.

REGISTRATION OF ENGINEERS.

At a meeting of the Institution of Production Engineers on Wednesday, Jan. 26, Mr. RICHARD HAZLETON, Secretary of the Society of Technical Engineers, explained the aims of the Bill for the registration of engineers which is being introduced again in this session of Parliament—subject to good fortune in the matter of the Members' Ballot for Private Bills—and also the objects which the Society have in view. The Bill was formally introduced last session, though it was not anticipated that any progress would be made with it.

On the general question of the desirability of registration for engineers as a means of improving their status, and also protecting the public, Mr. Hazleton said he does not believe there is any difference of opinion among engineers; and he agreed that it is on the details of any measure for securing this end that a scheme of this nature is likely to meet with serious opposition. He reminded his audience that the Bill of the Institution of Civil Engineers, which was introduced about five years ago, and was eventually withdrawn, practically provided that the Council of the Institution of Civil Engineers should be the Registration Authority; and it was because the other leading engineering institutions objected to this that the scheme failed.

Discussing the reasons why a practically unknown and admittedly new Society like the Society of Technical Engineers should have introduced a Bill now, Mr. Hazleton said it was solely with the object of ensuring that some serious action should be taken in the matter. His Council were convinced, from the inquiries they had made, that on the general principle there was no opposition from the majority of engineers, and the Bill as drafted contained merely tentative proposals for consideration by all concerned. It was the hope of his Council that the Joint Engineering Council would take up the matter in an authoritative manner; and in that event the Society of Technical Engineers would be only too pleased to hand it over. A communication had been sent to the Joint Engineering Council (consisting of the leading engineering institutions), and he was hoping it would be discussed at the next meeting of that body. In the meantime, he admitted that the leading engineering institutions had not come forward to express any definite views with regard to the Bill—a state of affairs which was regretted by the Council of the Society of Technical Engineers.

The general scheme of the Bill, as now drafted in a preliminary and tentative form for the purpose of discussion and final revision, is that there shall be a General Registration Authority; but that the Councils of the various engineering institutions scheduled to the Bill—no list has yet been drawn up—shall act as the Registration Authority for their particular members. A registration fee of £4 per annum is suggested, of which £1 will go to the Central Registration Authority, and the remaining £3 to the particular institution of which the member becomes a registered member. The proposal in the Bill is that the Central or General Engineering Council shall consist of representatives of the Government, of the Services, the scientific institutions, the universities, the technical colleges, the engineering employers' organizations, and the engineering employees' organizations.

Generally the Bill has been framed on the model of the constitution governing the General Medical Council, with modifications to fit the conditions of engineering. The object of making the Councils of the engineering institutions the actual registering authorities is to prevent a person registering with the General Engineering Council—if all registrations have to be through this body—and not being a member of any of the engineering institutions. Thus there can be no criticism that registration would undermine the membership of the engineering societies. Moreover, this would prevent anyone being registered as an engineer who had not the necessary qualifications. The Bill safeguards the position of engineers who are members of an institution and practising at the time of the passing of the Act, because every such person is entitled to registration provided application is made within two years of the passing of the Act; while people not members of an institution and practising at the time of the passing of the Act may apply to be registered on bringing satisfactory evidence that they have been engaged in responsible positions in the engineering industry for a period of not less than five years—such applications to be supported by three registered engineers. It was admitted that registration was the beginning of making engineering a closed profession; but it was claimed that not only the profession, but also the nation as a whole, would benefit thereby.

In again appealing to the large engineering institutions actively to take up this question of registration, Mr. Hazleton referred to the position in this respect in other countries. For several years, he said, registration of engineers has been the law of the land in many of the States of America. In New York, for instance, a very strict code is in force, and nobody is allowed to practise as an engineer, or to claim to practise engineering, unless registered. A similar measure has been in force in Italy for two years. Actually the scheme in Italy has been operative since the beginning of last year; and it is worked through Regional Councils and a Head Council at Rome. In New Zealand registration of engineers came into operation at the middle of last year. Australia has not yet attempted legislation, said Mr. Hazleton; but the leading institution of engineers in that country have been in communication with the Society of Technical Engineers here, and have stated that they are preparing a measure for presentation to the Commonwealth Government.

The Bill of the Society of Technical Engineers provides for fines and (or) imprisonment in the event of an unregistered person practising as an engineer; but, in the course of the discussion, Mr. Hazleton agreed that imprisonment might very well come out, and, as already mentioned, he emphasized that the proposals of the Bill are put forward as a basis for consideration and not as final proposals. He also agreed that there would be some firms in the country whose business title included the word engineers or engineering who would have to change their names, because they were of such a nature that they would not be employing registered engineers. In the same way, there was likely to be opposition to the Bill by some Labour Members of Parliament, because it would affect mechanics and people of that type, who might now call themselves engineers, but who would not be able to do so under a registration scheme, because their qualifications would not entitle them to be registered. Nevertheless, he believed that if the Society of Technical Engineers were compelled to go ahead without the support of the leading engineering institutions, and were successful in getting a place in the Private Members' Ballot, there were sufficient Members of Parliament in favour of the general scheme of registration of engineers to ensure a second reading and committal to a Standing Committee; and then the leading engineering institutions would have to justify their position in not supporting the proposals. However, he ended as he had begun, by expressing the hope that the work would be taken in hand by the Joint Engineering Council, and that all sections would co-operate.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Confidence in Gas.

SIR,—I was very pleased to see Mr. S. B. Johnson's letter in your issue of Jan. 26, and thoroughly agree with his remarks.

The young men of to-day who will be the managers of to-morrow naturally imbibe the ideas of their chiefs; and when at the various technical meetings one hears prominent engineers openly stating that gas for lighting is doomed, I do not think that the young men are entirely to blame in losing confidence in gas for private lighting, and, as Mr. Johnson says, "following the line of least resistance." Might I suggest that the engineers in the higher positions set the example by words and actions in showing that they have unbounded confidence in "Gas for everything—*including* lighting?"

Having had experience, I know the difficulties of pushing gas in the Tropics; but the fight is purely competitive, and not overcoming prejudice. In most places in England to-day gas undertakings are not in straight competition with electricity, but are also fighting a Government-fostered prejudice. Owing to the prominence given to the Government's electrical proposals, the uninitiated firmly believe that electricity is the cure of all evils; and whatever the cost, they will have it installed. In my own district, just recently, the Council decided to instal electricity on a housing scheme at a cost of £5 10s. per house. Gas would have cost £2 5s. It was decided, before the gas company's offer was read, that electricity be installed.

Though in the Tropics great perseverance and enthusiasm are necessary in pushing the sales of gas, yet at the present time still greater efforts are needed here.

A WHOLEHEARTED SUPPORTER OF GAS.

Feb. 5, 1927.

Remuneration for a Gas Chemist.

SIR,—I note, in the Technical Gas Press, that the Gas Department of the County Borough of Blackpool is advertising for a chemist, qualified to carry out all tests associated with gas-works practice, and that the salary offered is £180 per annum, less superannuation.

It is inconceivable that the Chief Executive Officer could be in full agreement with the terms of this appointment, as it is impossible to obtain a qualified chemist for this figure, unless advantage is taken of the economic position of one who may be stranded for want of a job. There are inexperienced youths who could carry out the mechanical side of such tests as are required, and who would be well paid at £180 per annum, but such a one would be more dangerous in the absence of higher technical supervision than could be imagined.

When it is remembered that it is on the accuracy of his methods, and the subsequent advice tendered, that many hundreds of pounds expenditure or receipts may depend, it will be realized that it is not worth while any works employing any but qualified experienced chemists. It is much safer to be without one. As householders, we even know the futility of engaging inexperienced, ill-trained plumbers. How much more important is it that the chemists that are employed by the gas industry shall be reliable, experienced men.

In my opinion, the very lowest salary that should be paid in the circumstances mentioned is £250 per annum net.

It is in no spirit of interference that I am communicating with you on this matter, but as one who is desirous of maintaining the efficiency of the gas industry as a whole.

A GAS CHEMIST (who will not apply).

Feb. 4, 1927.

MISCELLANEOUS NEWS.

THE GAS LIGHT AND COKE COMPANY.

ORDINARY GENERAL MEETING.

The Two Hundred and Twentieth Ordinary General Meeting of the Proprietors was held on Friday, Feb. 4, at the Chief Office of the Company, Horseferry Road, Westminster, S.W.—Sir DAVID MILNE-WATSON, LL.D., D.L. (the Governor), presiding.

The SECRETARY (Mr. W. L. Galbraith) read the notice convening the meeting; and the report and accounts were taken as read.

The corporate seal of the Company was thereafter affixed to the register of holders of capital stocks.

The GOVERNOR: Before I proceed to discuss the report and accounts, I should like to express the regret of my colleagues and myself that Mr. Godlee, who was elected a Director of the Company in 1909, and Deputy-Governor in 1921, recently found himself compelled to resign his Directorship, owing to ill-health. Before Mr. Godlee became a Director of the Gas Light and Coke Company, he had been a Director of the West Ham Gas Company since 1874; and he has been, therefore, a Director of Gas Companies for over fifty years. He will be much missed by his colleagues: and he carries with him into his retirement our best wishes. The Directors do not propose to fill the vacancy caused by Mr. Godlee's retirement. They have elected Mr. Henry Woodall as Deputy-Governor, in place of Mr. Godlee. Mr. Woodall has been a Director since 1913, and has had a large experience of gas administration.

A VERY DIFFICULT YEAR.

The year that has just closed has, as you are all aware, been a most difficult one for all the industries of the country, and not least of all for the gas industry. Our accounts have been so much influenced by the long coal stoppage that, before dealing with them in detail in the usual way, I propose, in order to avoid constant reference to the stoppage, to say something about it now. As you all know, simultaneously almost with the coal stoppage, a general strike began on May 4. This strike lasted nine days, and was a period of great anxiety to the country. Naturally, this anxiety was shared by the gas industry, although we felt confident that the trouble would not extend to us. Happily, it did not; and I should like to say for this Company that our co-partners, officers, and men generally continued to work satisfactorily during the difficult period.

THE COAL STOPPAGE.

We had, fortunately, in anticipation of the possibility of a coal stoppage occurring, taken the precaution of having good supplies of coal at our works; and, when it began, we had a stock equal to two months' normal consumption. With this supply of coal in hand, and by taking steps to increase the make of carburetted water gas, we were able to carry on for some time beyond the two months: but as it became more and more apparent that the stoppage was going to be a long one, and as it was quite uncertain when it would end, the Company were forced to begin buying foreign coal. This complete uncertainty was one of the chief difficulties of the situation. Week after week, month after month, passed, accompanied by the usual prophecies of the optimists that the trouble would not last much longer. Some there were who gave it as their opinion that it would end at the beginning of August, because no stoppage had lasted longer than three months: others thought that the termination of Summer Time would see the men back to work; and so on. None of these prophets, however, proved to be correct. We made inquiries from Ministers, Government Departments, Trade Union leaders, and from everyone connected with the coal trade, but could get no real guidance on the subject. The only thing to do, therefore, was to go on buying coal. At first, the prices of coal and freights were quite moderate; but as the stocks in this country began to get exhausted, and supplies from abroad more difficult to obtain, prices soared up, until at last we were paying as much as 90s. per ton for some of the coal delivered at our works.

WORLD RANSACKED FOR COAL.

I might almost say that we ransacked the whole world for coal; consignments coming from the United States, Canada, Germany, Silesia, Czecho-Slovakia, and even from India. As you all know, it was not until Nov. 30 that the stoppage came to an end; and, although work had been resumed in Warwick, Nottingham, Derby, and Leicester before that date, this was of little benefit to the Company. The fields from which we mainly receive our coal—namely, Durham and Yorkshire—were among the last in which a resumption of work took place; and we did not receive our first supplies of contract English coal until the middle of December. Some people are under the impression that, as soon as a coal strike or stoppage is over, everything immediately becomes normal, and that the Company should be able forthwith to obtain full supplies of coal. Nothing, of course, is further from the truth. For some time after the resumption of work, we had to live largely upon foreign coal; and the consumers in London should be thankful that we were able to purchase it, because if we had had to rely upon coal from Durham and Yorkshire during the weeks immediately following the end of the stoppage, we should have gone aground, and there would have been no gas in the greater part of London. I am glad, however, to tell you that our English contract coal is now coming in satisfactorily, and that we have received the last of the foreign coal. ["Hear, hear."] I might add that we found some of the American coal very good; but much of the Continental coal was unsuitable.

IMPORTANCE OF STOCKS.

It is necessary in the winter for a gas company of this size to have large stocks of coal to meet the exigencies of fogs and storms at sea: and when it is realized that in the depth of winter we use nearly 70,000 tons of coal a week, it will be understood that we had a very anxious time towards the end of the stoppage, when stocks at the works were running low. This is a special difficulty with which very large companies are beset. A small concern can by getting a few trucks or a steamer-load of coal, put itself right immediately, or in a comparatively short time: but if anything like a quantity of 70,000 tons a week is required, the difficulty is very greatly increased—in addition to which, as regards this Company, it must always be remembered that the coal has to be conveyed to most of our works either in barge by river or canal, or by truck over congested railway systems.

PAYING THE BILL.

With regard to the price of gas, we hoped during the first months of the stoppage that we might be able to see the trouble through without raising the price, specially as we had made some profit during the June half-year which otherwise would have been available for a reduction in the price. As time went on, however, it became clear that we could not get through without increasing the price of gas, and accordingly it was raised from September by the nominal

amount of 0·2d. per therm, or 1d. per 1000 c.ft. It soon became apparent that this small increase would not be sufficient, and we had to announce a further increase early in October of 1d. per therm, or 5d. per 1000 c.ft.; and when the price of coal had risen to the figure I have already quoted, we were forced to announce another increase of 1d. per therm. We felt that it was right that those who would use the gas made from this expensive coal should pay an adequate price for it, and that it would be a mistake to spread the expense over a long period ahead, thus imposing a burden on future consumers. I feel sure that you will agree with me that this was the correct policy.

While speaking at a meeting at Kensington in December last, I said—and it was generally reported in the Press—that the coal stoppage would cost the Company an extra £2,400,000 for coal, against which we hoped to get £500,000 back in increased prices of coke and other residuals—leaving a net burden on the Company of £1,900,000. Now that the last ton of foreign coal has been received, and we are in a better position to arrive at the full cost of all that this coal stoppage has meant to us, it is found that the figures I then gave in the shape more or less of an estimate are fully confirmed. As a great deal of the foreign coal that was purchased will be used in the current year, the accounts for 1927 will also be adversely affected. This explains the price we are now charging for gas.

Coming Reductions in Price.

I am glad to be able to tell the shareholders, and also the public, however, that we are rapidly getting through our troubles, and that the Directors have already announced a reduction in the price of gas of 1·4d. per therm, or 7d. per 1000 c.ft., out of the 2·2d. per therm, or 11d. per 1000 c.ft. by which the price has gone up owing to the coal stoppage. The new price is to come into force from March next.

It is not supposed to be a sign of good manners to blow one's own trumpet; but as no one ever does it for us, I think I may be permitted to express the satisfaction we feel that we were able to continue the supply of gas uninterruptedly during the seven months' coal stoppage, and to keep up its quality and pressure. Had we not bought foreign coal, the inhabitants of London would have had a very bad time, as many were without coal for months and regarded the gas company as their coal cellar. There was a little grumbling momentarily at the increase in the price of gas; but this ceased when it was realized that the price had not been raised until the fifth month of the stoppage, and then by only a very small amount. At its highest, the price of gas has been advanced by no more than 23 p.ct., and that for one quarter only, while we have paid for some of the coal as much as three or four times the amount of the pre-stoppage prices. We are particularly gratified to think that by the end of March we shall be able so to reduce the price that the increase over the pre-stoppage figure will fall from 23 to 9 p.ct. only; and I hope that well before the end of the year we shall be able to get back to a normal price. [Applause.]

I must ask your forgiveness for this somewhat long story; but the coal stoppage and its results, as I have already stated, completely overshadow everything else in the accounts. I am sure, therefore, you will excuse my having dealt with it at such length.

Expenditure on Business Development.

Referring, now, to the accounts for the year, you will see that on the capital account we have spent £31,000 on land, £89,000 on buildings, £239,000 for new and additional mains and service pipes, £33,000 on additional meters, and £263,000 on additional stoves—a total expenditure of £655,000, against which has been written off £85,000, leaving an increase on capital expenditure of £570,000. I am pleased to say that the increase in the sale of gas for the year permits of an expenditure of capital to practically the extent of the amount shown—or, to put it in another way, the cost of the capital employed in the business remains at the figure of 1s. 9d. per therm of gas sold which was shown by the accounts for the year 1925.

As you know, the Brentford amalgamation was completed on Jan. 1, 1926; and the accounts now represent a complete year's working in the amalgamated form. The figures for 1925 in the accounts which you have before you, I may say for your information, include Brentford; so the comparison is accurate as between the amalgamated Company and the two separate Companies for 1925.

Turning to the revenue account, which is the account most affected by the cost of the coal stoppage, and, therefore, rather difficult to follow in detail without a great deal of explanation, you will see that coal has cost a further £410,000, as compared with 1925. This increase in cost would have been very much larger but for the fact that the coal purchased under contract for the year 1925 was at higher prices than the coal so bought in 1926, and that we used 250,000 tons of coal less than in 1925 by increasing the make of carburetted water gas. Had we not been able to enlarge the make of water gas, the extra cost of coal would have been over £1,000,000 as compared with 1925, instead of the figure I have just given you of £410,000. In consequence of this variation in the method of making gas, you will find that the cost of oil was greater by £120,000, and of coke, &c., used in the manufacture of water gas by £270,000. This increased expenditure takes the place of the large extra amount that would have had to be spent had an equivalent amount of coal been used instead of oil and coke for gas making. The same reason applies to the difference—in this case a saving—which is shown under the heading of wages; the manufacture of water gas involving the employment of a smaller number of men.

Higher Expenditure on Efficient Service.

Under the heading of distribution of gas, you will find there are increases in every item shown in this section. This is not in any way to be regretted, as it is in this expenditure that you will find the promise of stability for our business in the future. The larger expenditure is also accounted for by the cost that is included of scrapping old meters, stoves, and fires. The policy of condemning and scrapping appliances that are more or less obsolete which we have pursued for the last two or three years, we are sure is a sound one, as it is only by giving efficient service to the public that we can hope to extend and continue our business profitably.

I do not think there are any other matters to call your special attention to on the debit side of the account; the increases in the items of co-partnership, annuities, and contributions to superannuation funds being explained by the inclusion of the Brentford staff.

Increased Revenue.

On the other side of the revenue account, you will find that the receipts from gas have risen by £818,000. This increase is due to the satisfactory growth in business over the year of nearly 2½ p.ct.; to the advance in the price of gas during the last few months of the year, which brought in as nearly as possible £350,000; and to the fact that, by comparison with the year 1925, the price of gas was higher during the June half of 1926. I am pleased to draw your attention to the very satisfactory increase in the rental of stoves, meters, and fittings, which together show a larger revenue of £87,000. Under residual products there are increases from the sales of coke, breeze, and tar to the extent of roughly £400,000, which is explained, of course, by the higher prices that we obtained for these residuals during the period of the coal stoppage. The extra receipts obtained in this way provide a further set-off to the total cost of the stoppage, the full effect of which would otherwise have had to be borne by the consumers of gas by way of a higher price.

Reduced Revenue from Sulphate.

There is one item, however, under the heading of residuals which unfortunately shows a decrease. I refer to sulphate of ammonia, the revenue from which is some £28,000 less than in 1925. This is due to the lower price we are now receiving for this product, brought about by the over-production of nitrogen in the world—a thing which may not suit the makers of sulphate, but which from the point of view of the agriculturist must be considered very satisfactory, as by the use of cheap fertilizers increased quantities of foodstuffs can be grown on a given space, a very desirable state of affairs in this densely populated world. That is the satisfaction you, as citizens, must derive from the lowering of sulphate prices, which are now much below those that were obtained even before the war. I may add that I do not see any prospect of a change for the better in the position as regards prices of this bye-product.

The Net Result.

To sum up the general result of the year's working, a credit balance has been transferred from the revenue account to the net revenue account of £1,338,000, as against £1,510,000 for the previous year. This revenue profit, together with the £100,000 which we have transferred from the special purposes fund (a fund which has been accumulated for the purpose of assisting the Company through a crisis such as we have just experienced), produces a balance of £677,000, as against £842,000 in 1925, after providing for interest charges for the year and the dividend charges for the June half-year. The balance of £677,000 enables the Directors to declare the usual dividend for the December half-year on the 4 p.ct. consolidated preference stock and the 3½ p.ct. maximum stock, and a dividend at the rate of 5 p.ct. per annum on the ordinary stock, which, together with the necessary contribution to the redemption fund of £15,000, absorb a sum of £612,000, leaving some £65,000 to be carried forward to the credit of the current year's accounts. This £65,000 compares with the £242,000 brought forward at the beginning of the year from the Gas Light and the Brentford Gas Companies.

During the year, the Company were fortunate in being able to raise £1,642,770 5 p.ct. redeemable debenture stock at 97½ p.ct. This was a very good issue indeed. It is a long time since the Company raised capital, as for the last 25 years we were able to meet all increased demands for gas by re-conditioning, instead of extending, our existing works. This process has now more or less come to an end; and it is a satisfactory sign of the progress of the Company that we have now to utilize more capital for the expansion of our business.

At the end of 1925 the Company applied to the Board of Trade for an increase in the standard price of gas. After an inquiry in March last, the Board of Trade raised the standard price from 11d. to 11·4d. per therm.

The Company's New Act.—A Minimum Dividend.

We also, as you know, promoted a Bill in Parliament for the purpose principally of obtaining more capital, and of being allowed to declare a minimum dividend notwithstanding the operation of the sliding-scale provisions. This was passed after a good deal of opposition in regard to the minimum dividend in Committees of both Houses; and it is satisfactory to tell you that the Bill received the Royal Assent in August last. The borrowing powers of the Company are increased by over £4,000,000; and we have obtained a minimum dividend of 5 p.ct. in respect of the ordinary stock of the Company, although in regard to the latter the House of Lords Committee added a proviso that the matter should come forward if required for revision at the end of every five years. I am sure you will regard a minimum dividend with great satisfaction, and agree with me that it was obtained none too soon. With regard to the sliding scale, it should be mentioned that the shareholders will still benefit with the consumers when the price of gas falls sufficiently to allow of a dividend above 5 p.ct. being declared. Its operation is only suspended when the dividend would otherwise fall below 5 p.ct. as a consequence of the price of gas having been increased. The Company's stock, had it not been for the minimum provision, would, owing to the recent crisis, have sunk to a very low figure; and this would have completely upset the investing public, who have barely recovered from their experiences during the war. Had the stock received another blow in this way, I do not think we should ever have been able again to inspire confidence in gas stocks. It has been hard enough during the last year to fight the adverse influence of the Electricity Bill, which was promoted by the Government. The

introduction of that Bill in the House of Commons sent down our stock by many points.

Another provision in our new Act is that our ordinary stock can be transferred in amounts of £1 instead of £5; and we are considering the question of having the price quoted on the market both for £100 and £1. This will open the door to small investors, and will, we think, help to stabilize the stock, as well as interest more of the public in the capital of this Company as an investment.

THE ELECTRICITY ACT.—NO CAUSE FOR ALARM.

I have already referred briefly to the Electricity Bill. This Bill has now become law; and it remains to be seen what the effect will be on the electrical industry. In any case, I feel quite confident that, if gas undertakings will only do their duty by the public, and see that the supply of gas is always satisfactory, there is little to fear from the shareholders' point of view as to the future. The gas industry did not oppose the Bill in principle, but exerted itself to obtain certain amendments which have been embodied in the Bill; so that the Electricity Act, from our point of view, is a much fairer measure than it was when it was introduced into the House of Commons.

ROYAL VISITS TO BECKTON AND KENSINGTON.

I am sure shareholders will appreciate the great honour their Majesties the King and Queen did to the Company when they visited our Beckton Works in July, to inaugurate the new coal handling plant. We were favoured with fortunate weather; and the King and Queen expressed themselves as very pleased and interested with everything they saw. In opening the plant, the King said: "I am very glad to visit this old-established gas-works at Beckton, and to inaugurate an important addition to the plant; for I realize how essential the gas industry is to the daily life of the community." The plant will be the largest coal unloading plant in the world, capable of dealing with 2000 tons an hour. We were also honoured with a visit from the Duchess of York to open the Kensington showrooms; and her presence was much appreciated by the Company. The showrooms are by unanimous consent among the finest gas showrooms in the country; and I sincerely hope that as many of you as possible will visit them. I need not repeat what I said last year as to the importance of showing, in these days of fierce competition, what gas can do, not only from the utility, but also from the artistic, point of view.

The year 1926 was one of many functions in addition to those to which I have already referred. The President of the Board of Trade, Sir Philip Cunliffe-Lister, and Lady Cunliffe-Lister, very kindly came to Fulham and inaugurated our new coal handling plant there. We have constructed a wharf at Fulham at which we unload coal from our own steamers. We already have two ships running there, and a third is being built. A very large economy is effected by bringing coal up the Thames by steamer direct to Fulham, and not having to transfer it to barges at Beckton.

A NEW EDUCATIONAL CENTRE.

Finally, we are much indebted to Sir George Hume, Chairman of the London County Council, for coming to open our new premises at Nine Elms—which have been named "Watson House"—in which we have established our new training shops. These premises have been fitted up with the latest arrangements for the teaching of our fitter apprentices and others, as we feel that there is a growing necessity of having a well-trained staff. It is essential, of course, to have good gas and efficient apparatus; but you must also have expert workmen to fix the apparatus, and these we hope to get in increased numbers through our training centre. We had one for a long time at Horseferry Road; but the accommodation was too cramped.

As I have already said, the amalgamation with Brentford was completed on Jan. 1, 1926. The works in some cases are in need of reconstruction, to which we shall devote ourselves; and we are also taking steps to improve the supply of gas generally in the Brentford district. The Brentford Company were handicapped with difficulties in regard to the restriction of their works and the inability to get another site on the river. It is now possible, however, to re-arrange the avenues of supply; part of the district of that Company being served by the existing works of the Gas Light and Coke Company. In this way, it is certain that both areas of supply will benefit in the long run.

The past year, taken as a whole, has been one of the most trying for the staff and workers generally; and I am glad to say that they have all risen splendidly to the occasion. It would be invidious to single out any one individual or department for praise. To all of them the hearty thanks of the Directors are accorded. [Applause.]

THE INDUSTRIAL POSITION.

With regard to the general industrial position, there is no doubt that the events of the past year have dealt a very serious blow to the trade of the country; and it is no wonder that at the present time everyone is thinking and talking of means to prevent a recurrence of these troubles. Innumerable associations and societies are being formed with the object of promoting peace and goodwill in industry; and at most shareholders' meetings Chairmen are expressing their views on the subject. It has never been a habit to enter into politics from this Chair; and I propose, therefore, to say nothing of a political character to-day.

There can be no objection to the formation of associations and societies to discuss industrial peace, but that does not make it the less desirable for each business to try to solve the problem for itself, and in its own way—especially as such individual efforts are more likely to bear fruit than grandiose schemes. ["Hear, hear."] We in this Company have done what we can to secure industrial peace, and I think successfully, as the events of the last few years have proved. In the year 1909 we started our co-partnership scheme; and there are now 14,500 co-partners, holding over £600,000 of the Company's ordinary stock. They have thus acquired a substantial interest in the capital of this business. We have also done a great deal in other ways to re-introduce the personal touch which we are generally told has been lost in large undertakings. In order to recover this personal touch, we have instituted various funds for the social welfare of the workers generally; and these funds are largely administered by the men themselves. We have formed a Sports Association, of which there are 5000 members; and we have six sports grounds where all ranks are brought together in friendly touch with one another, from Directors downwards. These things, all taken together, certainly produce the right spirit in our Company; and I feel certain that what we and some others have done in this direction could be extended to a large number of businesses, and thus, through individual efforts, help to arrive cumulatively at a good feeling generally throughout the nation.

I can only say, in conclusion, that I hope the year on which we have just entered will be free from industrial trouble, and so give the industry of the country an opportunity of enjoying a period of prosperity. I have now pleasure in moving

> That this meeting do agree with and confirm the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 27th ult.

THE GOVERNOR CONGRATULATED.

The DEPUTY-GOVERNOR (Mr. Henry Woodall): I have very much pleasure in seconding the resolution. It is unusual, ladies and gentlemen, for the Deputy-Governor to take up any of the time of these meetings; but this is not quite an ordinary occasion. It is the first time our Governor has addressed us under his new title of Sir David Milne-Watson. [Applause.] I am sure you will all be very glad to know how much this honour is appreciated, not only by Sir David's many friends, but by the gas industry generally, and by the staff and workmen of this Company. I do not wish to detain you many minutes, and therefore I will not read out to you a list of the Associations and Committees over which our Governor presides, or of the enormous number of functions which he attends in connection with the industry. I will only say that whenever his valuable advice is asked for and required, it is always readily given. Sir David realizes, perhaps more clearly than anyone else, how important it is that we should all work together for the general good; and it is for this reason, among others, that the gas industry welcomes most heartily the honour that has been bestowed upon him. Sir David has had many hundreds of letters of congratulation; but I think I shall be right in saying that nothing has gratified him more than the pleasure that was shown by the workmen of the Company when they heard this good news. Last week I had the pleasure of visiting Beckton with the Governor; and as we made our way round the works men had collected at various points, in order to cheer him and to congratulate him on his new honour. I think that this spontaneous and quite unexpected greeting shows quite clearly the goodwill that exists in our Company. ["Hear, hear."] Sir David has done much to create this goodwill and to increase it; and I think that is perhaps one of his greatest achievements. Goodwill and good understanding between masters and men are not, I am afraid, as general as we should wish them to be; but it is only these which will really bring about the prosperity and happiness of the individual and the nation.

Mr. W. A. HOUNSOM: I am quite sure that I shall have the sympathy of every individual in this meeting in joining in the words that have fallen from the Deputy-Governor, regarding the signal honour that has been bestowed by His Majesty upon the Governor. The shareholders and every workman owe much to Sir David; and I cannot help thinking that one of the most valuable portions of his speech to-day was that in which he referred to co-operation and mutual helpfulness in connection with all business undertakings. Whether it be a company of this magnitude, or whether it be a small local organization, co-operation is of the first importance all round. I have felt ever since the last annual meeting of this Company that hardly enough was made of the great amalgamation with the Brentford Company. We have heard some of the results to-day as shown in the working of the year that is past. We look for still greater results. That very large territory, with all its possibilities, opens out so very much for this Company. To those who have had the great responsibilities and the terrible anxieties of the past year, an expression of sympathy and congratulation is due from the shareholders. We see before us the members of the Board and representatives of the great departments of the Company; but we do not forget that far and wide through our great district are the employees of the Company, to whom we are all indebted for the helpful work that has been done. What would have been the condition of this great Metropolis without gas during the coal strike? And the fact that gas has been so helpful all round is very promising for us, because gas stoves that once go into a house are not very often scrapped. It is a wonderful industry that we are concerned with; and the country has much for which to be thankful to gas. This Company have a magnificent organization, and one that goes on from strength to strength. It is an organization in which we ought to have, and have, a certain amount of pride; and the shareholders are grateful to those who have experienced such great difficulties, and have faced those difficulties, and overcome them. We can look forward with hope to the future.

The GOVERNOR: I should like to thank the Deputy-Governor and Mr. Hounsom for the extraordinarily nice things they have said about me personally. It is quite embarrassing for me to sit here and listen to these encomiums; but I assure you I do appreciate very highly your kind feelings. It has been wonderful to find what satisfaction the honour that has been done me has given, not only to my private friends, but to those with whom I am associated in business in this industry and elsewhere; but I think that of all the congratulations I have received there has been none that I appreciate so warmly as those that have come from the workmen of this Company. [Applause.] I feel very proud indeed to be your Chairman, and to be surrounded by such able helpers on the Board, on the staff, and among the employees generally. Long may we continue to work together as a happy family. I would also thank Mr. Hounsom for what he has said regarding our efforts during the coal strike. It was a very trying time; but we have come through it well. What we did has been

appreciated, I think, all over London; and gas has got "nearer home" than it ever did before.

The report and accounts were then unanimously adopted.

THE DIVIDENDS.

The GOVERNOR: I will now ask the Secretary to read the minute of the Court of Directors recommending dividends for the past half-year.

The SECRETARY thereupon read the following from the Directors' minutes of Jan. 21:

> Resolved, that it be recommended to the Ordinary General Meeting of Proprietors to be held on the 4th proximo (1) that the sum of £15,000 be set aside out of the divisible profits of the Company for the half-year ending on the 31st day of December last towards the redemption fund, in acordance with the provisions of the Company's Acts of 1903 and 1926; (2) that dividends as follow for such half-year be declared—namely:
>
> | | | | | |
> |---|---|---|---|---|
> | On the 4 p.ct. consolidated preference stock, at the rate of . . . . . | £4 | 0 | 0 p.ct. | per annum. |
> | On the 3½ p.ct. maximum stock, at the rate of . . . . . | £3 | 10 | 0 p.ct. | ,, ,, |
> | On the ordinary stock, at the rate of . | £5 | 0 | 0 p.ct. | ,, ,, |
>
> All subject to deduction of income-tax.

These recommendations were adopted, on the proposition of the GOVERNOR, seconded by the DEPUTY-GOVERNOR.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR: Two Directors (Mr. Thomas Goulden and Mr. R. M. Holland-Martin) retire by rotation in the ordinary way at this meeting, and offer themselves for re-election. Mr. Goulden I need not introduce to you. Before he became a Director, he spent his life on the Company's engineering staff, and ended by becoming Chief Engineer. In him we have a tower of strength. I have much pleasure in moving his re-election.

The DEPUTY-GOVERNOR seconded the proposition, which was agreed to.

The GOVERNOR: Mr. Holland-Martin has been a Director for many years. He is a well-known banker, and is of great service to the Board. I have much pleasure in proposing his re-election.

The DEPUTY-GOVERNOR seconded this, and it was carried.

Thereafter the Auditors (Messrs. J. A. Stoneham and P. H. Ashworth) were re-appointed, on the motion of Mr. W. MANN, seconded by Mr. H. L. MANN.

SALE OF LAND.

The GOVERNOR: There is one small item of business remaining: Authority is asked of the proprietors for the sale of lands in various parts of the Company's area. No. 1 refers to a house in the Holly Lodge Estate, Highgate, purchased in 1924. Circumstances having changed, the Company have resold it. No. 2 refers to the Company's premises in Kensington High Street and Young Street, which formed the Kensington district offices and showrooms. These have been replaced by the premises in Church Street. No. 3 refers to premises in Palatine Road, Stoke Newington, at one time used as district offices and showrooms, and now no longer required. No. 4 refers to a small portion of the land at Greenford purchased by the late Brentford Gas Company. This has been sold to the Middlesex County Council for the purposes of their Greenford Road improvement scheme. The Secretary will read the terms of the resolution which I now beg leave to move.

The SECRETARY read the resolution giving authority to sell the lands; and it was seconded by the DEPUTY-GOVERNOR, and carried unanimously.

VOTE OF THANKS.

Mr. H. RAYNER: Before we disperse, I have the pleasure to propose a cordial vote of thanks to the Governor for his most interesting and able address, and to the Directors, officers, and all employees of the Company for their strenuous labours during the past year. Our vote, of course, includes an expression of hearty congratulation to the Governor on the honour which we are all so glad has been conferred upon him—an honour which, in view of his many public services, is richly deserved, and which we hope to see followed by still higher honours in the future. [Applause.] As an old servant of the Company—now, alas! upon the shelf—able to remember many past Governors, from the days of Mr. Adams Beck to those of Sir Corbet Woodall, I venture to say that, great as many of them were, there was none more capable, more convincing, or more inspiring than the present occupant of the chair. May he long live, in health and strength, to carry on his good work. The past year has been, as the Governor has said, a very eventful and a very trying one. Among many other important events, it has seen the King and Queen and other members of the Royal Family visiting the works and showrooms of the Company, and exhibiting the greatest interest in the work of this gigantic undertaking. It has also witnessed the passing of an Act of Parliament of the utmost importance to us as shareholders, inasmuch as it contains a clause which, except in very remote circumstances, ensures to us a minimum dividend of 5 p.ct. But, above all, the past year has seen the Company maintaining an undiminished supply of gas to the public throughout the course of the longest and most disastrous coal strike experienced in the history of the country—and not only maintaining it, but doing so in a way which may be fairly described as a veritable triumph. The Governor has recently had occasion to remark upon the shortness of the public memory. While the strike lasted, people were only too glad to avail themselves, quite regardless of the cost, of the form of fuel which the Company could, and did, supply under great difficulties; but directly the strike was over, and long before conditions could have become anything like normal, they began to clamour for a reduction of this cost. Let us, as shareholders, not lay ourselves open to a similar charge of short memory, but let us now and always remember the achievements of Directors and employees alike in a year of such exceptional trial. In view of the circumstances, I ask you to pass the vote with something more than even your usual enthusiasm.

Mr. MARK JOHNSON: As one who has the interests of the workmen at heart, I should like to emphasize that we couple together in our vote of thanks the Directors and the whole of the employees of the Company. I have much pleasure in seconding the vote.

The motion was then put to the meeting, and carried with acclamation.

The GOVERNOR: On behalf of my colleagues and myself, and all the employees, I thank you for your vote. It has been a strenuous time; and it is very pleasant that it should be recognized by this large meeting in the way it has been. Personally, I must thank for his kind remarks my very old friend Mr. Rayner, who took care of me when I first entered the Company's service.

KNARESBOROUGH GAS-WORKS SOLD TO THE HARROGATE GAS COMPANY.

Major W. G. CHARLESWORTH, who presided at a special meeting of the Knaresborough Urban District Council on the 1st inst., said the meeting had been called to consider the sale or otherwise of the Council's gas undertaking. The Harrogate Gas Company had offered the Council £13,166, which had been considered inadequate. As the result of a conference, it was amended to £16,000. The Company were willing to take over all the staff; and the question of solatium would have to be decided later. He added that, worked out on capital value, his estimate of worth was £15,200.

Lady EVELYN COLLINS: How does the Harrogate charge for gas compare with Knaresborough?

The CHAIRMAN: Ours is 10d. per 1000 c.ft. more.

Mr. WRIGHT said he was confident Knaresborough would save anything from £1200 to £1500 on gas bills alone.

Lady EVELYN COLLINS asked what actual saving the transfer would effect, and what was the position with regard to loans.

The CHAIRMAN said the outstanding loan on the gas-works was £4559. If they received £16,000, they would have a net figure of £11,000, not including stores, to pay off loans or otherwise.

Mr. ELLIS remarked that to bring the works up-to-date meant an outlay of £14,000.

Mr. EDDY said the Manager (Mr. Wadsworth) held out no hope that in the future they would be able to compete with the Harrogate Company's charge for gas. There was also the assurance that the quality of gas would be maintained.

The CHAIRMAN said he personally thought it was the duty of the Council to part with the works when they had such an offer before them. The transfer would mean a saving of 8½d. or 9d. in the rates.

Mr. BLAKELEY moved that the offer of the Harrogate Company be accepted.

Mr. A. V. CREASEY, who seconded, said he trusted the Council would do all in their power to push their own electricity scheme in the future.

The proposition was carried unanimously.

The Knaresborough Gas-Works are among the oldest in the country, having been built in 1825, under an Act of 1823.

CONTRACTS OPEN.

Coal.

The Milford Haven Urban District Council are inviting tenders for the supply of gas and steam coal and anthracite. [See advert. on p. 338.]

Fireclay and Silica Goods.

Tenders are invited by the Silsden Urban District Council for the supply and delivery of fireclay and silica goods. [See advert. on p. 338.]

General Stores, Pipes, Mantles, &c.

The City of Stoke-on-Trent are inviting tenders for material and stores required by the Corporation Gas Department. [See advert. on p. 337.]

Pipes and Specials.

The Pontypridd Urban District Council are inviting tenders for the supply and delivery of steel mains and specials. [See advert. on p. 337.]

Coal Handling Plant.

The Corporation of the City of Dunedin (New Zealand) notify that the date for the receipt of tenders for coal-handling plant has been extended to March 19. [See advert. on p. 338.]

EXTENSIONS.

Spalding's New Works.

Considerable developments of the existing plant at Spalding Gas-Works have been decided upon by the Urban District Council. New carbonizing plant is to be installed, and other substantial additions to the resources of the undertaking are to be made, for which purpose it was determined at the last meeting of the Council to apply to the Ministry of Health for authority to borrow £33,577. Mr. R. W. Calderwood has been appointed General Assistant to the Gas Manager; the appointment to terminate when the new works have been completed. Preparations are in progress for the supply of electricity to the town by means of an underground cable laid from Peterborough; and having regard to prospective contingencies, the Council have appointed the Gas and Water Engineer (Mr. R. J. Calderwood) Manager of the Electricity Department.

Yorkshire Tar Distillers, Ltd., inform us that their registered office is, as from last Monday, No. 1, East Parade, Leeds.

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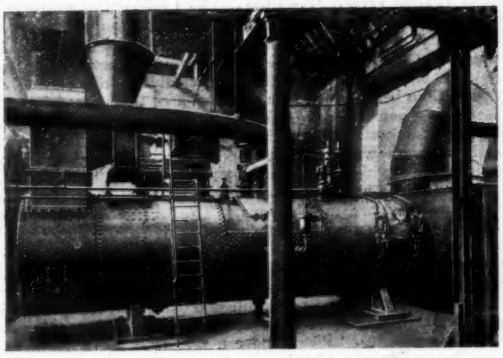

Do you know this ?

A return of 100% PER ANNUM is quite usual on money invested in these boilers.

One Gas Company is obtaining 5¾ lbs. Steam per lb. of Coke used to heat their non-regenerative horizontal retorts, and 3½ lbs. of Steam per lb. of Coke in the case of regenerative horizontal retorts —— from WASTE HEAT ALONE.

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THE WASTE HEAT SPECIALISTS,
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LONDON, S.W.1.
Phone: VICTORIA 2802-3.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDER.

Exeter Gas Light and Coke Company.

To authorize the Company to purchase the gas undertaking at Topsham; to extend the limits of supply; to authorize the use of scheduled land for gas purposes; to increase the capital; to provide for the setting-up of a scheme of co-partnership; and for other purposes.

AMENDING ORDERS.

Hampton Court Gas Company.

To extend until Sept. 30 the standard price of 15·4d. per therm which is at present operating.

Wimborne Minster Gas Company, Ltd.

To substitute for the existing standard price of 12·8d. per therm a standard price of 15·2d., until Dec. 31, 1928.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market has not undergone much change during the past week. Durham coking coals, which had a burst of strength a few weeks ago, have continued dull, and weakened, if anything, still further. Second-class gas coals have perhaps been slightly firmer. On the whole, however, the position is much the same, with collieries maintaining that lower prices would show a loss, and that therefore output must be curtailed rather than quote lower figures.

At present, business is still practically confined to prompt orders, and, as is usual when trade is scarce, shippers who can offer suitable loading terms can often obtain concessions in price. As regards forward contracts, buyers and sellers are still apart in their ideas. Collieries are generally not eager to fix up far ahead at present prices, and buyers say that current quotations are too high. Exporters can make no headway with consumers on the Continent, who apparently can satisfy their requirements elsewhere on more favourable terms.

Wear Special gas makes quote nominally 18s. f.o.b., and best qualities 17s. 6d. Second-class gas is 15s. 6d. to 16s. Durham unscreened coking is 16s. to 17s., according to quality, though even best makes can hardly get the latter price. Bunkers are quoted about 17s. for best qualities.

Coke is fairly steady; gas being quoted 23s. 6d. f.o.b. for shipment, and steadily increasing quantities of foundry being placed at about 24s. 6d.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire are moving forward under contract, with indications of slightly increased prices for forward business.

Collieries are reported to be losing many shifts per week by reason of the shortage of empties, and although the position is not quite so acute as it has been, the efforts of railway companies to remedy this state of things have so far had no apparent result.

The demand for house coal continues on the quiet side, with delays en route which are causing serious difficulty to distributors, particularly those in the metropolitan area and southern counties.

It is apparent that, with the exception of the iron and steel industries, it will be some time before there is anything but a gradual improvement among the "key" consuming industries of the country.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports): South Yorkshire—Hards, Association, 22s. 3d.; washed doubles, 25s. to 25s. 6d.; washed singles, 21s.; washed smalls, 16s. 3d. to 17s.; rough slack, 13s. 9d. to 14s.; smithy peas, 24s. to 25s. 6d. per ton. West Yorkshire—Hartley's (f.o.b. Goole), 21s. to 23s.; washed doubles, 22s. to 22s. 6d.; washed singles, 20s. 6d. to 21s.; washed smalls, 13s. 6d. to 14s.; unwashed doubles, 17s. 9d. to 18s. 6d.; rough slack, 13s. 6d.; coking smalls, 11s. 6d. to 12s. per ton. Derbyshire and Nottinghamshire—Top hards, 22s. 6d. to 25s.; washed doubles, 23s. to 23s. 6d.; washed singles, 21s.; washed smalls, 15s.; unwashed doubles, 19s. to 20s.; rough slack, 13s. 6d. to 14s. 6d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 21s. to 22s.; gas coke, 34s. 6d. per ton.

MIDLANDS.

The characteristics of the market have undergone little change. Household coal is being called for as fast as it can be marketed, and values remain firm. There is a scarcely perceptible expansion of the demand for industrial fuel; and save in one or two special cases, values cannot be called strong. Smalls and slack are weaker. Complaints of wagon shortage have not ceased; but they are less prevalent. The distributive plant of merchants and dealers is equal to the occasion.

Most of the coal is going into quick consumption. Stocks on wharves are extremely low. Best hand-picked house coal makes up to 45s. at the pithead. There is a difference of 20s. between this and the lower grades which go into domestic use. Nuts and beans are quoted at about 16s. Supplies tend to get ahead of demand. Slack is readily available. It would be incorrect, however, to infer that the market is plethoric. Collieries are ready to accept very low rates for spot lots which are impeding their operations, but for best qualities 10s. or more is realized.

Blast-furnace coke remains steady at 20s. f.o.t. It is reported that a number of ovens which have been delayed by breakdowns in starting-up again are now completing repairs and making ready for production. No expectation is held out to furnacemen, however, that they will get coke at the pre-stoppage rate for a long time to come.

Nothing has been done as yet to initiate negotiations for fresh contracts for gas coal.

TRADE NOTES.

"T.I.C." Tar Treatment Plant.

The Reading Gas Company have placed an order with the Woodall-Duckham Vertical Retort & Oven Construction Company (1920), Ltd., for a "T.I.C." (lead bath) tar treatment plant, to deal with 18 to 20 tons of crude tar per 24 hours.

"The Power of the Press."

This is the title of a booklet recently published by Messrs. Hans Renold, Ltd., of Didsbury, Manchester. This has been specially compiled for the printing trade; and in it the firm endeavour to define the reasons why this trade should consider the use of chain as a power transmission medium.

Change of Name.

The name of the firm of Ackroyd & Best, Ltd., of Morley, near Leeds, makers of well-known brands of glassware, has been changed to Hailwood & Ackroyd, Ltd. Mr. Hailwood continues as Managing Director of the Company, and the staff remain the same; the name having been altered out of compliment to Mr. Hailwood, who has been the main organizer and inventor of the Company for very many years. There has been no "Best" connected with the firm for the greater part of that period.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 7.

There is no change in the position of pitch. There is little demand, and the price continues nominal at about 120s. per ton in bulk at makers' works

Creosote is firm at about 9d. per gallon, in bulk.

Solvent naphtha is quiet and weak at 1s. 10d. to 1s. 11d. per gallon. Pure toluole is about 2s. 5d. to 2s. 6d. per gallon, and pure benzole about 2s. 3d. per gallon.

Crystal carbolic acid is quiet at about 6¼d. per lb.

Tar Products in the Provinces.

Feb. 7.

The average values for gas-works products during the week were: Gas-works tar, 80s. to 85s. Pitch, East Coast, 110s. to 115s. f.o.b. West Coast—Manchester, 107s. 6d. to 112s. 6d.; Liverpool, 110s. to 114s.; Clyde, 112s. 6d. to 115s. Benzole, 90 p.ct., North, 1s. 9d. to 1s. 10d.; crude, 65 p.ct. at 120° C., 1s. 2½d. to 1s. 3d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 10d. to 1s. 11d. Toluole, naked, North, 1s. 8½d. to 1s. 9½d. nominal. Coal-tar crude naphtha, in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5½d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 7½d. to 7¾d.; salty, 7½d. to 7½d.; Scotland, 7½d. to 7¾d. Heavy oils, in bulk, North, 8¾d. to 9d. Carbolic acid, 60 p.ct., 1s. 8½d. to 1s. 9½d. prompt. Naphthalene, £11 to £14; salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Gas-Works for Sale.—The Hillsborough (co. Down) Gas-Works, together with plant and fixtures, are being offered for sale by auction. The buildings include retort house, meter house, governor house, and purifier house.

New Companies.—The Parkinson Stove Company (Australia) has been registered, with a capital of £100,000, in £1 shares, to acquire from the Parkinson Stove Company, Ltd., the goodwill of the Australian branch of their business; and to carry on the business of manufacturers of, and dealers in, stoves, ranges, lamps, and other appliances. The Ruud Manufacturing Company has been registered, with a capital of £20,000, to carry on the business of manufacturers of water heaters, &c.

Inquiry at Skegness.—In our notice of this inquiry in the "JOURNAL" for Feb. 2, the following statement was made: "Difficulties which, through inadequate plant, have for some time been experienced in connection with the Skegness Gas-Works, have led the Urban Council to embark on a scheme of extension . . . ." This, writes Mr. F. Young, the Engineer and Manager to the Skegness Gas Department, is inaccurate. No such reason, he says, has been given either at the inquiry or elsewhere; and the extensions are required to meet the increasing demand for gas consequent on the growing popularity of Skegness as a seaside resort. During the past seven years the output has more than doubled, and the carbonizing plant has become too small for safety.

Long High-Pressure Gas Main.—It is stated by the Los Angeles correspondent of the "American Gas Journal" that interests controlling the Southern California and Midway Gas Companies, in conjunction with the Southern Counties Gas Company and the Los Angeles Gas and Electric Corporation, have begun the carrying out of the most important gas transmission project ever undertaken in the United States. In order to prevent the possibility of any gas shortage in the communities these Companies serve, a 15-in. high-pressure pipeline, 75 miles in length, is being built to carry natural gas from the highly productive Ventura Avenue Field to the city of Los Angeles. A new Corporation, the Ventura Fuel Company, has been organized to carry out the project. The Midway Gas Company are supervising the erection of the compressor station and equipment at Ventura, while the Southern Counties Gas Company are in charge of the pipeline. According to Mr. A. B. Macbeth, Executive Vice-President of the Southern California and Midway Gas Companies, who is also President of the American Gas Association, the new line will be the largest gas carrier in the West. Its capacity will be approximately 45 million c.ft. of gas a day.

Slough Debenture Stock Issue.—Messrs. A. & W. Richards, of 37, Walbrook, E.C., are offering on behalf of the Directors of the Slough Gas and Coke Company £5000 of 5 p.ct. perpetual debenture stock, and £15,000 of ordinary stock. The minimum price of issue of the debenture stock is £97 10s. per £100, and of the ordinary stock par; and tenders must reach Messrs. Richards not later than 11 o'clock on Thursday morning, Feb. 17.

Stoke-on-Trent Linking-Up Scheme.—A satisfactory settlement of the controversy between the Stoke-on-Trent City Council and the Wolstanton Urban District Council with regard to the laying of a high-pressure gas-main from the Etruria Works to the Longport Works was announced at a meeting of the latter body a few days ago. The Clerk (Mr. E. Hollinshead) said he had been in constant communication with the Town Clerk of Stoke-on-Trent, in order to safeguard the interests of Wolstanton, and had intimated that, provided the Stoke-on-Trent Corporation inserted certain terms in their proposed Parliamentary Bill, the Wolstanton Council would withdraw opposition to it. The matter had been before the City Council, and all new clauses approved.

"L & N" Low-Temperature Process.—Following upon the formation of L & N Coal Distillation, Ltd., with Colonel J. T. C. Moore-Brabazon, D.S.O., M.P., as Chairman and Joint Managing Director (see *ante*, p. 154), the following Board of Directors has been constituted: Mr. P. C. Tennant (Chairman and Managing Director of the Glico Petroleum Company; Director of the Phœnix Oil and Transport). Colonel K. P. Vaughan-Morgan, M.P. (Director and Vice-Chairman of the Morgan Crucible Company). Mr. W. A. Woodeson, Gateshead-on-Tyne (Director of Messrs. Clarke, Chapman, & Co.; Chairman of the Chesterfield Tube Company). Mr. Frank Middleton, Barnsley (Joint Managing Director of the Old Silkstone Collieries; Managing Director of the Garforth Collieries). Mr. Henry Ellison, Leeds (Messrs. Ellison & Mitchell, Don Chemical Works; Director of the Yorkshire Iron and Coal Company). Major Bryan Laing, Joint Managing Director (Managing Director of Sensible Heat Distillation).

Protest against Over-Legislation.—The Liberty and Property Defence League, in their report of their work during the past year, say that "the parliamentary session of 1926 witnessed another flood of legislation. Of the 143 Public Bills brought forward, no fewer than 68 were passed, many of them hurriedly on the closing day; little, if any, time being given to a discussion of their provisions. Instead of enacting new laws to interfere with the liberties and rights of the people, and further adding to the countless army of officials and inspectors, Parliament would be better employed by repealing many of the vexatious laws which restrain personal freedom, hamper private enterprise, and check national prosperity. Many of these Acts are as unnecessary as they are mischievous. The only class that benefits by them is the bureaucracy, which becomes more and more swollen as these legislative follies increase. If Parliament spent a few years in cleansing the Statute Book of the mass of restrictive and foolish Acts by which it is encumbered, the trades and industries of the country would be set free to re-establish those flourishing conditions which over-legislation has to such a large extent destroyed. Lord Bramwell's wise motto, 'Please govern me as little as possible,' is one which the nation should adopt and enforce, and thus save itself from being overwhelmed by disaster."

In Peebles the price of gas has been raised to 5s. 10d. per 1000 c.ft.—an increase of 5d. Gas coke has been reduced to 35s.

In the Leeds City Council, on Feb. 2, Mr. E. J. Clark (the Chairman of the Gas Committee) withdrew for further consideration in committee a minute approving plans for the erection of a new Gas Department workshops and offices, estimated to cost £110,000. The project had been expected in the first place to cost probably about £50,000 or £60,000. The site has been purchased; but on top of the estimate now submitted, it is probable that, with the internal equipment of the workshops, the total will be increased to £150,000.

"The Industrial Use of Town Gas" was the subject of a lecture by Mr. H. Hems, of the Research Laboratories of the Birmingham Gas Department, to members of the Walsall and District Building Trades Guild, last Friday night. He dealt with the tremendous increase which has taken place in the use of gas for furnace work in Birmingham and other towns, outlined the development of design up to the modern recuperative and regenerative furnaces, and illustrated his points with lantern slides of a number of constructions and installations.

Speaking at a meeting of the Walsall Rotary Club, on Friday last, Mr. J. A. Crabtree (the President) suggested that, if the Town Council continued to keep up the prices of gas and electricity with the object of making big profits, manufacturers would be compelled to investigate the possibilities of other forms of power. The Mayor (Mr. J. A. Leckie) replied to this by stating that the gas undertaking was faced with a very serious deficit on the current year. He did not know what would be thought when, instead of large profits to go to the rates, there was a big loss to be met somehow. It should be understood, however, that the prices had not been raised in Walsall to anything like the same extent as in some other places.

Complaint has been made by the Morecambe Corporation Gas Engineer that a 9-in. gas main supplying Heysham is being endangered by the work in connection with the laying of a sewer by the Heysham District Council, the trench of which runs parallel with the gas main and at the same side of the road. The Gas Engineer reported last week that subsidences had already taken place on half the section, affecting every gas service in the district served by the main; and the subsidence would require renewal of services from the main to the houses. There was also evidence of damage being done to the main. The Morecambe Gas Committee have called the attention of the Heysham District Council to the matter, and have given notice that in case of damage the Heysham Council will be held responsible.

STOCK MARKET REPORT.

THE Chinese situation exerted considerable influence on the stock markets last week, and investors were rather less inclined to make further purchases. The prospects of an early reduction in the Bank Rate is not so encouraging, and the fact that Gold is going out of the country shows that the Bank of England reserves are still open to attack from outside sources.

In the Gas Market, however, there was no depression. The certainty of a general establishment of the minimum dividend principle is making itself felt; and although there is no extravagant improvement in values, the quotations are gradually creeping up. Last week the only falls recorded were in the case of companies operating abroad. It will be noticed that Newcastle consolidated was marked up 3 points, South Metropolitan ordinary 2½ points, and South Suburban 5 p.ct. and Tottenham 3½ p.ct. 2 points each. The increase in the South Metropolitan and South Suburban prices may be due to the announcement which appeared in the Press last week of the working agreement arrangement proposed between the two Companies, the most interesting feature of which will be the acquisition by the larger Company of £500,000 of the South Suburban ordinary stock and the substitution of an equivalent amount of 6 p.ct. preference stock.

The latest dividend announcements are Newcastle consolidated £2 10s. p.ct., making £5 p.ct. for the year, and Cardiff £3, making £6 p.ct. for the year.

The issue of £30,000 6 p.ct. preference stock in the North Middlesex Gas Company was largely oversubscribed, tenders ranging from £107 10s. to the minimum of par. The British Gas Light Company has also made an issue of £200,000 5 p.ct. debenture stock, redeemable Dec. 31, 1951. The stock was sold at 93 p.ct., less ½ p.ct. commission.

The following transactions were recorded during the week:

On Monday, Aldershot "C" 72⅜, 73¼, Bombay 21s. 3d., British 110, European 6⅛, 6 5/16, Gas Light and Coke 86⅜, 86⅝, 87, 87¼, 3½ p.ct. maximum 60¼, Imperial Continental 134, Lea Bridge 96, Portsmouth 104, 104½, 5 p.ct. maximum 79½, Primitiva 14s. 10½d., 15s., 15s. 1½d., 15s. 3d., 4 p.ct. debenture 69, Sheffield "B" 96⅜, South Metropolitan 95¾, 96, 96½, 96⅜, 97⅜, 98, South Suburban 99, 99½, 100. Supplementary prices, Barnet 4 p.ct. debenture 73, Bournemouth new 6 p.ct. preference 11½, 11 5/16, Gas Light and Coke 5 p.ct. deb. 99⅝, Lea Bridge 7 p.ct. deb. 101.

On Tuesday, Commercial 4 p.ct. 84½, 85, European 6 7/16, Gas Light and Coke 86⅜, 86⅞, 87, 87¼, Hong Kong and China 12½, Portsmouth 80, Primitiva 15s., 15s. 1½d., South Metropolitan 3 p.ct. debenture 59, 6½ p.ct. debenture 102¼, 103, Southampton 5 p.ct. 77¼, 77¾. Supplementary prices, Bournemouth new 6 p.ct. preference 11⅜, Gas Light and Coke 5 p.ct. deb. 99⅛, Montevideo 6 p.ct. deb. 98½.

On Wednesday, Bournemouth 5 p.ct. 12⅛, 12¼, "B" 12⅛, 6 p.ct. preference 11½, 11 5/16, British 7 p.ct. preference 114½, Cardiff 7½ p.ct. debenture 102, Commercial 4 p.ct. 85½, European 6½, Gas Light and Coke 86½, 86⅝, 87, 87¼, 4 p.ct. preference 76¾, 77, 3 p.ct. debenture 59½, Imperial Continental 132, 132½, 133½, 134, Newcastle 3½ p.ct. 70½, 71, Primitiva 14s. 9d., 14s. 10½d., 4 p.ct. 1st debentures 85, 85½, South Metropolitan 97½, 97⅜, 98½, Wandsworth 'C" 90, 90½, Wimbledon stock 101½, 102. Supplementary prices, Croydon 7 p.ct. debenture 103½, Gas Light and Coke 5 p.ct. debenture 99⅝, Swindon 5 p.ct. debenture 81½.

On Thursday, Commercial 4 p.ct. 84, Continental Union 30½, 7 p.ct. preference 84, Gas Light and Coke 86½, 86⅝, 87½, 3 p.ct. debenture 58⅝, Oriental 101, Primitiva 14s. 9d., 14s. 10½d., 15s., 4 p.ct. debenture 70½, 71, San Paulo 5 p.ct. debentures 48½, South Metropolitan 98, Southampton 77½, Tottenham "B" 92½, 93. Supplementary prices, Ascot 10 p.ct. 10, Gas Light and Coke 5 p.ct. debenture 99¾, Lea Bridge 7 p.ct. debenture 101½, Montevideo 6 p.ct. debenture 98½, North Middlesex 6 p.ct. preference 104½.

On Friday, Aldershot 4 p.ct. preference 70, Bombay 21s. 9d., Colonial 26s. 3d., 8 p.ct. preference 21s., Commercial 4 p.ct. 85½, Gas Light and Coke 86⅞, 87, 87¼, 4 p.ct. preference 76½, 3 p.ct. debenture 59, 59¼, Imperial Continental 134, 134½, Primitiva 14s. 6d., 14s. 9d., South Metropolitan 98½, 99, Wandsworth "B" 104, "C" 90. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 99⅝.

The money position was somewhat easier at the close of last week. Fresh accommodation was obtainable at 4 p.ct. down to 3½ p.ct. There was very little variation in discount rates; but with the average Treasury Bill rate slightly lower at £4 4s. 2·89d. p.ct., the tendency was to fall.

In the Foreign Exchange Market sales on Russian account caused the Dollar-Sterling rate to droop. The rate closed at 4.84 35/32. Forward dollars were, however, quoted at par. There was no important change in French francs, which closed at 123.30. Belgas were quoted at 34.87½; Italian lire at 113¼; and the Dutch exchange at 12.12⅜.

Silver was offered on Chinese account, and the price fell to 27⅜d. per oz. Gold remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3, 1925. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Feb 4.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Aug. 12	5	5	Aldershot 5 p.c. max. C.	72—75	..	72⅜—73½
323,992	,,	,,	4	4	Do. 4 p.c. Pref.	67—72	..	70
1,551,868	,,	Sept. 30	6½	6½	Alliance & Dublin Ord.	80—85	..	..
274,000	,,	Jan. 13	4	4	Do. 4 p.c. Deb.	65—68	..	..
800,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd.	1—1½	..	21/3—21/9
170,000	10	Aug. 26	8½	8½	Bournemouth 5 p.c.	12—13	..	12⅝—12⅞
800,050	10	,,	7	7	Do. B 7 p.c.	12—13	..	12⅝
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	11½—11 5/16
50,000	Stk.	Jan. 18	8	8	Do. 8 p.c. Deb.	53—56	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb.	73—76	..	..
214,740	,,	Aug. 26	12	12	Brighton & Hove Orig.	163—168	..	..
244,200	,,	,,	9	9	Do. A Ord.	125—130	..	..
1,387,500	,,	July 22	5	5	Bristol 5 p.c. max.	84—85a	..	..
885,000	,,	Sept. 30	7	8	British Ord.	107—110	+1	110
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref.	112—117	..	114½
150,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	+7	..
100,000	10	Dec. 9	6	6	Cape Town, Ltd.	7—8	..	..
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	July 22	6	6	Cardiff Con. Ord.	97—100	..	..
287,860	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	102
157,150	,,	Aug. 12	6½	5	Chester 5 p.c. Ord.	89—94b	..	..
79,185	1	Sept. 30	12/-	12/-	Colombo Ltd. Ord.	27/—29/-	..	..
24,495	1	,,	1/6½	1/6½	Do. 7 p.c. Pref.	20/—22/-	..	..
321,490	1	Oct. 14	1/9½	1/7½	Colonial Gas Assn. Ld. Ord.	25/—27/-	..	26/3
178,900	1	,,	1/9½	1/7½	Do. 8 p.c. Pref.	21/—28/-	..	21/-
1,518,280	Stk.	Aug. 1	5½	5⅜	Commercial 4 p.c. Cap.	82—85	..	80—85½
560,000	,,	,,	5/8/4	5/8/4	Do. 8½ p.c. Cap.	81—84	..	..
476,000	,,	Dec. 30	8	8	Do. 8 p.c. Deb.	54—57	..	..
800,000	,,	Sept. 30	§2	§1	Continental Union, Ltd.	28—33	..	30½
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	82—85	..	84
787,150	,,	Aug. 12	6½	6½	Croydon sliding scale	96—99	..	..
408,100	,,	,,	5	5	Do. max. div.	78—81	..	..
492,270	,,	Aug. 26	9	8	Derby Con.	107—109e	..	..
85,000	,,	Dec. 30	4	4	Do. Deb.	73—75c	..	..
209,000	,,	Sept. 16	5	5	East Hull Ord. 5 p.c.	78—82	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,002,180	10	Sept. 30	†4	†3	European, Ltd.	6—7	−½	6½—6¾
13,747,460	Stk.	Aug. 12	4/17/4	5/1/4	Gas Light & Coke 4 p.c. Ord.	86—88	..	86½—87½
2,600,000	,,	,,	3½	3½	Do. 8½ p.c. max.	59—62	..	60½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	75—78	..	76¼—77
5,602,630	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb.	58—61	..	58¾—59½
181,315	,,	,,	—	6	Do. 6 p.c. Br'st'd Rd. Db.	100—105	..	..
43,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
89,600	,,	Aug. 26	6½	6½	Hastings & St L. 5 p.c. Conv	87—92	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	66—71	..	..
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd.	12—18	−2½	12½
178,200	Stk.	Sept. 16	5	5	Hornsey Con. 3½ p.c.	69—71	..	..
1,976,000	,,	Nov. 11	†10	10	Imperial Continental Cap.	132—135	+1	132—134½
226,170	,,	Aug. 12	3½	3½	Do. 3½ p.c. Red. Deb.	68—71	..	..
235,242	,,	Aug. 12	6½	6½	Lea Bridge 5 p.c. Ord.	94—99	..	96
1,127,340	,,	Aug. 12	5½	5½	Liverpool 5 p.c. Ord.	80½—81½b	+1	..
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	104—106b	+1½	..
165,736	,,	Aug. 26	8	9	Maidstone 5 p.c. Cap.	112—117	..	..
63,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb.	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean	5½—6½	..	..
541,920	Stk.	Nov. 25	†6	†5	Montevideo, Ltd.	79—82	..	..
1,051,315	,,	Aug. 12	5	5	Newcastle & Gateshead Con.	72½—73½d	+3	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	70—72d	..	..
529,705	,,	Dec. 30	3½	3½	Do. 3½ p.c. Deb.	67½—67½d	..	..
15,000	,,	Aug. 26	11½	11½	North Middlesex 10 p.c.	155—160	..	..
91,530	,,	,,	8 5/9	8 5/9	Do. 7 p.c.	109—114	..	..
300,000	,,	Nov. 25	7	9	Oriental, Ltd.	97—102	..	101
188,120	,,	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Aug. 26	—	7/4/0	Portsm'th Con. Stk. 4 p.c Std.	102—107	..	104—104½
236,732	,,	,,	—	5/0/0	Do. 5 p.c. max.	78—81	..	79½—80
1,289,909	1	—	—	—	Primitiva Ord.	14/6—15/6	−/3	§14/6—15/3
282,200	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	84—86	..	85—85½
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	69—71*	..	..
434,963	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb.	69—71	..	69—71
150,000	10	Sept. 30	6	6	San Paulo 6 p.c. Pref.	7½—8	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	48½
270,000	Stk.	Sept. 16	6	5½	Sheffield A	96—98e	..	..
419,968	,,	,,	6	5½	Do. B	96—98e	..	..
1,047,000	,,	,,	6	5½	Do. C	96—98e	..	..
90,000	10	June 11	4	—	South African	4—6	..	..
5,609,895	Stk.	Aug. 12	7	5	South Met. Ord.	97—100	+2½	95⅝—99
1,895,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb.	57—60	..	59
734,000	,,	Sept. 16	6½	6½	Do. 6½ p.c. Red. Db.	101—103	..	102½—103
91,500	,,	Aug. 12	8½	8½	South Shields Con.	114—116d	..	..
1,187,795	,,	Aug. 12	6½	6½	South Suburban Ord. 5 p.c.	99—102	+2	99—100
368,837	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93 96	..	..
647,740	,,	Oct. 14	5	5	South'mpton Ord. 5 p.c. max.	76—79	+1	77½—77⅝
121,275	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—73	..	..
250,000	,,	Aug. 26	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	July 22	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	91—94	+2	92½—93
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	99—101	..	..
181,255	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
258,251	,,	Aug. 26	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	69½—70½d	..	..
197,294	,,	Aug. 26	6⅜	6½	Do. 5 p.c. pref.	85—90	..	..
88,330	,,	,,	5	5	Do. 5 p.c. Maidenh'd	82—87	..	..
91,800	,,	,,	6⅜	6½	Wandsworth, Wimbledon, and Epsom—	85—90	..	..
30,000	,,	July 8	8½	8½	Wandsworth A 5 p.c.	122—127	..	..
255,686	,,	,,	7	7	Do. B 3½ p.c.	102—107	..	104
412,450	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	90—90½
852,000	,,	,,	6⅜	6⅜	Wimbledon 5 p.c.	98—103	..	101½—102
98,000	,,	,,	7½	7½	Epsom 5 p.c.	104—109	..	..
88,416	,,	Dec. 30	3	3	3 p.c. Deb.	54—57	..	..

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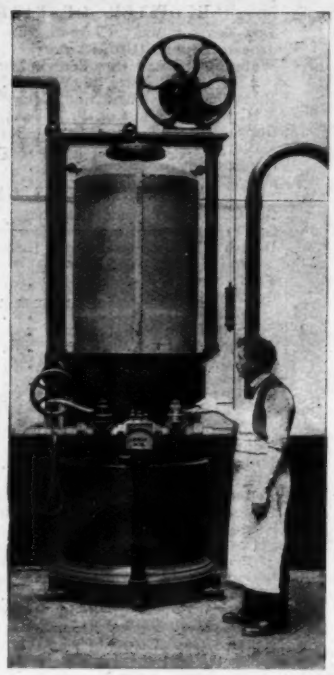

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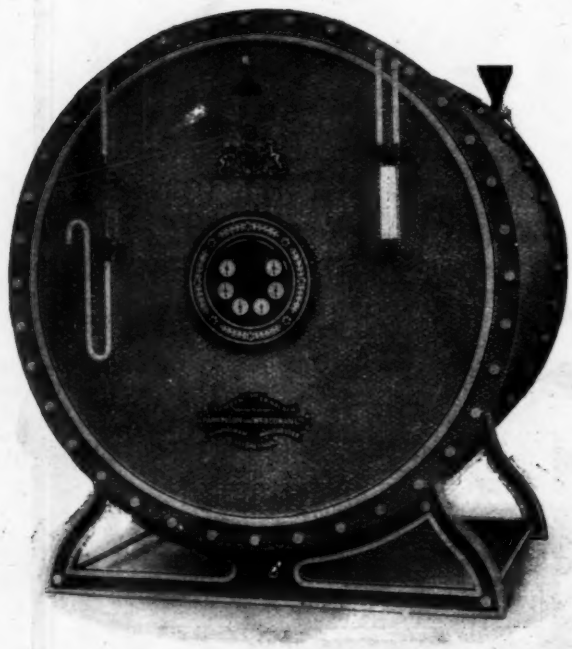

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